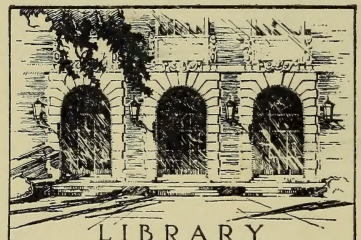

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The Graduate School

Announcement for 1934-1935

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GRADUATE SCHOOL CALENDAR

Summer Session

1934

June 18, Monday.....Registration day.
June 19, Tuesday.....Instruction begun.
July 4, Wednesday.....Legal holiday.
July 20, Friday.....Latest date for registering for French and German examinations.
July 27, Friday.....Examination in French.
Aug. 3, Friday.....Examination in German.
Aug. 4, Saturday, 12 M.....Latest date for candidates for degrees in August to deposit theses.
Aug. 10, 11, Friday, Saturday.....Summer session examinations.

First Semester

Sept. 14, 15, Friday, Saturday.....Registration days.
Sept. 15, Saturday.....Latest date for registering for French and German examinations.
Sept. 15, Saturday, 5 P.M.....Latest date for registration of former students without penalty.
Sept. 17, Monday.....Latest date for candidates for masters' degrees in October to file applications for degrees and to deposit theses.
Sept. 19, Wednesday, 8 A.M.....Instruction begun.
Sept. 21, Friday.....Examination in French.
Sept. 28, Friday.....Examination in German.
Oct. 4, Thursday.....Latest date for changing study-lists without fee.
Oct. 6, Saturday.....Latest date for preliminary examinations (for full residence).
Nov. 5, Monday.....Latest date for candidates for professional engineering degrees to file statements of professional study and experience.
Nov. 28, Wednesday, 12 M.....Thanksgiving recess begun.
Dec. 3, Monday, 1 P.M.....Instruction resumed.
Dec. 22, Saturday, 12 M.....Holiday recess begun.
Dec. 31, Monday, 5 P.M.....Latest date for candidates for professional engineering degrees to submit outlines of theses.

1935

Jan. 3, Thursday, 1 P.M.....Instruction resumed.
Jan. 18, Thursday.....Latest date for filing applications for masters' degrees to be conferred in February.
Jan. 18, Thursday.....Latest date for candidates for Ph.D. degree in February to deposit theses.
Jan. 19, Saturday.....Latest date for registering for French and German examinations.
Jan. 22, Tuesday.....Semester examinations begun.
Jan. 25, Friday.....Examination in French.
Jan. 30, Wednesday.....Semester examinations ended.

Second Semester

1935

Feb. 1, Friday.....Latest date for candidates for masters' degrees in February to deposit theses.

Feb. 1, Friday.....Examination in German.

Feb. 1, 2, Friday, Saturday.....Registration days.

Feb. 2, Saturday, 5 P.M.....Latest date for registration of former students without penalty.

Feb. 6, Wednesday, 8 A.M.....Instruction begun.

Feb. 21, Thursday.....Latest date for changing study-lists without fee.

Feb. 28, Thursday.....Latest date for preliminary examinations (for full residence).

March 1, Friday.....Latest regular date for applications for scholarships and fellowships for 1935-36.

April 18, Thursday, 12 M.....Easter recess begun.

April 20, Saturday.....Latest date for registering for French and German examinations.

April 23, Tuesday, 1 P.M.....Instruction resumed.

April 26, Friday.....Examination in French.

May 1, Wednesday.....Latest date for filing applications for masters' degrees to be conferred in June.

May 1, Wednesday.....Latest date for candidates for professional engineering degrees to deposit theses.

May 3, Friday.....Examination in German.

May 13, Monday.....Latest date for candidates for Ph.D. degree in June to deposit theses.

May 15, Wednesday.....Latest date for filing applications for masters' degrees to be conferred in August.

May 15, Wednesday.....Pre-registration for masters' degrees to be conferred in August.

May 24, Friday.....Semester examinations begun.

May 27, Monday.....Latest date for candidates for masters' degrees in June to deposit theses.

May 27, Monday.....Latest date for Ph.D. finals.

June 3, Monday.....Semester examinations ended.

June 10, Monday.....Sixty-fourth Annual Commencement.

Notes

Examination in one foreign language must be passed before residence on second year may be counted (pp. 13, 16).

Two copies of thesis are required of candidates for masters' and doctors' degrees (pp. 13, 17).

Candidates for masters' degrees announce thesis subjects at beginning of second half-year of work, or after completion of four units, or at beginning of third summer session (p. 13).

Candidates for Ph.D. degree announce thesis subjects within six weeks from beginning of third year of residence (p. 17).

Candidates for Ph.D. degree deposit theses two weeks before date of final examination (p. 17).

THE GRADUATE SCHOOL
EXECUTIVE FACULTY

ARTHUR CUTTS WILLARD, B.S., *President of the University*

ROBERT DANIEL CARMICHAEL, PH.D., *Professor of Mathematics and Dean of the Graduate School*

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THOMAS WHITFIELD BALDWIN, PH.D., *Professor of English*

CLARENCE ARTHUR BERDAHL, PH.D., *Professor of Political Science*

DAVID JOHN DAVIS, M.D., PH.D., *Professor of Pathology and Dean of the College of Medicine*

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WHITNEY CLARK HUNTINGTON, M.S., C.E., *Professor of Civil Engineering*

SIMON LITMAN, Dr.Jur.Pub. et Rer.Cam., *Professor of Economics*

FRANCIS WHEELER LOOMIS, PH.D., *Professor of Physics*

HAROLD HANSON MITCHELL, PH.D., *Professor of Animal Nutrition*

HERBERT FISHER MOORE, M.E., M.M.E., D.Sc., *Research Professor of Engineering Materials*

REXFORD NEWCOMB, A.M., M.ARCH., A.I.A., *Professor of the History of Architecture and Dean of the College of Fine and Applied Arts*

RAYMOND STRATTON SMITH, PH.D., *Professor of Soil Physics*

CHARLES ZELENY, PH.D., *Professor of Zoology*

THE GRADUATE SCHOOL

History and Organization

The University of Illinois offered facilities for advanced study and research in various lines as early as 1872. Organized graduate instruction, however, under the name of the Graduate School, was first undertaken in 1892. In 1894 the administration of the school was vested in the Council of Administration, and the Vice-President of the University became Dean of the School. In 1906 the Graduate School was organized as a separate faculty.

By action of the Trustees the teaching faculty of the Graduate School includes all members of the University Faculty who give instruction in approved graduate courses. The affairs of the School, however, are in charge of the Executive Faculty.

Admission

Admission to the Graduate School may be granted to graduates of institutions whose requirements for the bachelor's degree are substantially equivalent to those of the University of Illinois and to applicants from other institutions approved by the Executive Faculty, as hereinafter provided. *Admission to the Graduate School does not, however, imply admission to candidacy for an advanced degree, and gives no right or claim to be so admitted. Such candidacy is determined by the faculty after the student has demonstrated by his work here, for from two to five months, that he has the ability to do major work of graduate character. A mere accumulation of "credits" or "grades" is not sufficient.*

Admission to graduate courses may be granted only to those who have had the requisite undergraduate work in those courses or departments. But a student of mature age who satisfies the Dean and the department concerned of his ability to pursue graduate work in a given line may be enrolled in particular graduate courses, without reference to a degree, and permitted to carry on such study or investigation under the direction of a department of the University as the department shall recommend and the Dean approve.

Application blanks for admission may be secured from the Registrar of the University. Every applicant must submit with his application for admission an official transcript of his college record.

Character of Graduate Work

The principal aim of graduate study is the development of the power of independent work and the promotion of the spirit of research. Each candidate for a degree is expected to have a wide knowledge of his subject and of related fields of work; for the graduate student is not expected to get from lecture and laboratory courses all the knowledge and training necessary to meet the requirements for his degree.

Registration and Program of Study

The following regulations concerning registration and program of studies are laid out primarily for first-year students. Second-year and third-year gradu-

ate students fill out their programs irrespective of the unit value of courses, according to their needs, under the advice of their instructors.

Registration.—Each graduate student must register at the beginning of each semester. The registration of a new student may be accepted at any time provided the student is prepared to take up courses actually under way. Credit towards the fulfillment of the residence requirement dates, however, from the time of registration and not from the beginning of the semester or year in which the student enters. Registration will not be permitted later in the year than April 1, except in the case of students who expect to continue through the summer session, or are returning to complete a year's work which has been interrupted by unavoidable circumstances. *No student is permitted to attend any university course in which he is not registered.*

A new student must fill out in duplicate an application for admission and submit it to the Registrar, from whom, after the approval of his application, he will receive a card of admission and a study-list which will give details of procedure in registering. He should fill out the study-list after consultation with his adviser, or the person in charge of his major work, and also with the instructors whose courses he wishes to elect. *Registration, including the payment of fees, must be completed by the close of the registration days of the Graduate School. Otherwise a fee of $5.00 for late registration will be charged all former students.*

Changes in Study-lists.—A graduate student is expected to plan his work so carefully that changes in his study-list during the semester will not be necessary. When a change seems advisable, however, it may be permitted without fee if made within three weeks of the date of registration. After that date a fee of one dollar is charged for each change, except that the total charge for rearrangement authorized on any one change slip shall not exceed two dollars.

Advanced Undergraduate Courses Open to Graduate Students.—

1. *Courses not open to students below senior standing.* Unless otherwise specified on the student's program by the department concerned, such courses listed for four or five hours of undergraduate credit are treated as unit courses for graduate credit, or as half-unit courses when listed for less than four hours of undergraduate credit.

2. *Courses open to students of junior standing.* Unless otherwise specified on the student's program by the department concerned, such courses listed for four or five hours of undergraduate credit are treated as half-unit courses for graduate credit, or as quarter-unit courses when listed for two to three hours undergraduate credit. Courses to which sophomores are regularly admitted may not be taken for graduate credit, either major or minor.

Seniors and Graduate Study.—If at the beginning of the second semester of his senior year a student who has been in residence at least one year is within five hours of a bachelor's degree, he may be permitted to register for courses which may count for residence for a master's degree, provided his program does not require more than twelve formal class, lecture, or laboratory exercises a week, and is approved by the Dean at the time of registration. Only students of excellent record will be allowed this privilege.

Miscellaneous and Listeners' Courses.—Graduate students are permitted under proper circumstances to attend classes as listeners, and to elect miscellaneous subjects, that is, courses which do not count toward an advanced degree. Listeners' cards may be obtained at the Dean's office. A graduate student in full standing and carrying a minimum program, may be permitted, under proper circumstances, to attend one class as a listener, or to elect one miscellaneous subject (that is, a course which does not count towards an advanced degree). No subject is open as a listener's or miscellaneous course unless it has a specific educational bearing on the student's major or minor subjects of study.

A student who elects a miscellaneous course is required to register in it, do the work, and pass the semester examinations, unless he is permitted to withdraw under the rules. A student who has a listener's card is not permitted to participate in the class work or the examination.

No student may register for a full minimum program of work for graduate credit if it is necessary for him to carry at the same time more than one miscellaneous subject and to visit one course.

Students on the Staff.—Assistants and others on the university staff who undertake to do graduate work are permitted to take an amount of work determined by the terms of their employment. Such a student, if required by his engagements to teach more than five classes a week or to have laboratory work or supervision exceeding ten hours a week, may not receive his master's degree at the end of one year, nor his doctor's degree at the end of three.

Residence and Work Done Elsewhere.—Continuous residence and study are required of all members of the Graduate School, unless they are granted leave of absence by the Dean, upon recommendation of the professor in charge of their work, for the purpose of carrying on elsewhere studies or investigation in the line of work for their degrees.

Graduate Study in the Summer.—Graduate students in the summer session are subject to the same scholastic requirements as those in the regular university year. Their study-lists must be approved by the Dean of the Graduate School, or his representative. Attendance during four out of six consecutive summer sessions, or one semester and two summer sessions, is considered the equivalent of one year in residence. The faculty is unwilling to accept summer-session work beyond the master's degree towards the doctor's degree, except in the case of a student who works in a summer session preceding or following a regular year's attendance at the University. In no case may the last year's work for the doctorate be done in disconnected summer sessions.

No course offered in the summer session may be taken for credit towards a higher degree unless it is described in the summer-session circular as accepted for that purpose.

Summer Work in Medical Sciences.—Graduate courses in medical sciences are offered in the summer quarter between June and September at the College of Medicine of the University of Illinois in Chicago. Circulars describing the courses offered and conditions of admission and work may be obtained from the Secretary of the College of Medicine, 1853 W. Polk Street, Chicago.

Failures.—A graduate student who fails in any course in his major subject cannot secure his degree in the same year in which the failure occurred. No condition examinations are given graduate students.

WITHDRAWAL.—If after registration a graduate student wishes to withdraw from any course or to add other work, he must first secure the necessary papers from the Dean's office. See the regulations concerning changes in study-lists, page 10. If he wishes to withdraw from the University he must get clearance papers at the Dean's office.

Masters' Degrees

CHARACTER OF MASTERS' DEGREES.—The master's degree conferred depends upon the character of the bachelor's degree. The usual practice is that A.M. shall follow A.B., and that M.S. shall follow B.S. However, this practice may be departed from in cases where the undergraduate course of study of the candidate was of a kind for which some reputable institutions in this country give A.B., while others give B.S.

AMOUNT OF WORK REQUIRED.—Candidates for the degree of Master of Arts or Master of Science are required to do at least one full year's work in residence, including a thesis. By this is meant from four to five unit courses each semester or their equivalent. A unit course is one which requires ten hours of time a week through one semester, or a minimum of 180 hours, irrespective of the mode of distribution of that time in class work, laboratory work, and private study. Four such courses or their equivalent constitute a full *minimum* program for one semester, and eight such courses, or their equivalent, constitute the *minimum formal* year's work accepted for a master's degree. Only first-rate students are permitted to secure a degree with this minimum program.

Unless otherwise permitted, every student must take each semester at least one course open to graduate students only (courses numbered 100 and upwards).

In the first year of his graduate study each student is required to attend a minimum of four formal class, lecture, or laboratory exercises a week. He may not attend more than twelve a week without special permission.

WORK DONE ELSEWHERE.—Members of the staff and high school teachers residing and employed in Urbana or Champaign who have done graduate work in approved institutions elsewhere may secure credit not to exceed four units towards the master's degree by passing examinations in that work. They may complete the work for the degree by securing at least four units more while registered in the Graduate School for not less than one academic year.

Students in zoology who take work in a marine or fresh-water biological laboratory or station are permitted to offer not less than six weeks nor more than nine weeks of such work in partial fulfillment of the requirement for the master's degree.[1] This privilege is granted only when the work is done with the permission of the faculty (secured in advance), in an approved laboratory, and under instructors accepted by the faculty. Credit for such work may be secured by examination after the student has submitted an official certificate of attendance at the laboratory or station, together with a full written report of the work done there. No candidate for the master's degree may avail himself of this pro-

[1]The experience at a marine laboratory which, as indicated above, is optional with the candidate for the master's degree, is required of all candidates for the doctorate in zoology.

vision who is not registered in the Graduate School for one full academic year, during which he shall do the rest of the work necessary for his degree.

Similar arrangements are made, under similar conditions, for students of geology in connection with Geological Surveys.

Majors and Minors.—A candidate for a master's degree may do all his work in one subject, or he may select a major and one minor, or a major and two minors. A major or minor denotes the field of knowledge of a department, or such part thereof as constitutes a separate and independent division of that field. For a master's degree a major is at least half the work, or a minimum of four units, for one year. Less than one unit may not be counted as satisfying the requirements of a minor without the approval of the department concerned.

Foreign Language.—The ability to use one or more of the modern languages ordinarily studied in the undergraduate curriculum is expected of all candidates for the master's degree, and in some lines of study is required. No student will be permitted to acquire residence toward the second year for the doctorate until he has passed the preliminary examination in at least one of these languages.

Masters' Theses.—Each candidate for a master's degree is required to present two copies of a thesis on some subject approved by the professor in charge of his major work. Such approval, except in case of students working for masters' degrees in summer sessions only, must be secured and the subject of the thesis filed at the office of the Graduate School not later than the beginning of the second half year of residence.

Students working for masters' degrees exclusively in summer sessions must announce their thesis subjects not later than the beginning of their third session in residence. The requirement of a thesis may be waived, however, on the recommendation of the professor in charge of his major work and the approval of the Dean, *provided application to waive the thesis is made at the time for announcing thesis subjects.* A student excused from writing a thesis must replace it with courses of instruction.

No one will be excused from writing a thesis unless one-half of his program of studies consists of courses numbered 100 and upwards.

The thesis required from a candidate for a master's degree ordinarily will demand one-fourth of the student's time and may not exceed one-third of it. The thesis must be typewritten, on "thesis paper,"[1] and the title page must be printed. The carbon copy may be on plain paper of approximately the same weight as the thesis paper. Both copies of the thesis in its final form, together with a certificate of approval by the proper officer, must be left by the professor in charge at the Dean's office at least two weeks before the date on which the degree is to be conferred. No article prepared for another use, or previously published, will be accepted as a thesis.

Applications for Degrees.—Each candidate for the degree of Master of Arts or Master of Science shall file an application for the degree on a blank provided for the purpose, to be had at the Dean's office. For the dates of applications and of deposition of theses, consult the calendar at the beginning of the bulletin.

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[1]No other will be accepted by the Dean. "Instructions for the Preparation of Theses" may be obtained at the Dean's office.

Degrees in August.—Students who expect to become candidates for the master's degree in August may be recommended at the June meeting of the Senate subject to the successful completion of the work for which they are to register in the summer session. However, in order to avail themselves of this privilege, students must file with the Dean before the June meeting of the Senate an exact statement of the work necessary to complete the requirements for the degree. Blanks for this purpose may be secured at the Dean's office.

Thesis Work on Leave of Absence.—Under proper conditions a student may be permitted to complete the last fourth of his work, if devoted to his thesis, under leave of absence for a period not to exceed the equivalent of two semesters. To get such permission the student must have secured credit for at least six units; must petition for the privilege; must submit to the Dean an outline of the proposed investigation, approved by the professor in charge of his major work, and must submit satisfactory evidence that adequate facilities are available to him at the place where he intends to do the proposed work. Approval on all these points must be obtained one collegiate year before the thesis is due. Immediately following approval the student must register and pay an incidental fee of $20.00.

Grades.—Students' work is graded in five classes, A, B, C, D, and E. The last indicates a failure. D indicates unsatisfactory, though passable, work.

A student who receives two units of a grade below B during his first year of graduate work may not complete the first year of residence by carrying the minimum program of eight units for the master's degree. Three units of a grade below B disqualify a student as a candidate for a degree.

A failure or absence from examination in any course or failure in any other examination prescribed by the department of the major may prevent the conferring of the degree; and, as already indicated, failure in any course in the major field precludes the conferring of the degree in the same year.

Second Degrees in Engineering

Two classes of second degrees are open to graduates of the College of Engineering, namely, academic and professional.

The *academic* second degree in engineering is Master of Science, following Bachelor of Science, in civil engineering, electrical engineering, etc. This degree is conferred in accordance with the regulations described above for *academic work in residence only.*

The *professional* second degrees in engineering are as follows:

Master of Architecture, after B.S. in architecture.

Architectural Engineer, after B.S. in architectural engineering.

Ceramic Engineer, after B.S. in ceramic engineering.

Chemical Engineer, after B.S. in Chemical Engineering.

Civil Engineer, after B.S. in civil engineering or in railway civil engineering.

Electrical Engineer, after B.S. in electrical engineering or in railway electrical engineering.

Mechanical Engineer, after B.S. in mechanical engineering or in railway mechanical engineering.

Engineer of Mines, after B.S. in mining engineering.

Engineer-Physicist, after B.S. in engineering physics.

Professional degrees in engineering may be conferred on two classes of candidates: (1) those who have received an academic degree in engineering from the University of Illinois; (2) those who have received an academic degree in engineering[1] from other institutions of equal standing and who have been members of the teaching or research staff of the College of Engineering or Engineering Experiment Station or the Department of Chemistry of the University of Illinois for at least three years prior to the conferring of the professional degree.

A candidate declares his candidacy by filing with the Dean of the College of Engineering, as chairman of the committee in charge, a detailed statement covering his professional engineering experience. This statement must be made upon a standard form supplied by the Dean of the College of Engineering, as chairman of the committee in charge, and must be filed not later than the first Monday in November preceding the commencement at which the candidate expects to receive the degree. No statement of experience will be considered by the committee which does not show that the candidate has had a minimum of four years of acceptable engineering experience after receiving the degree of Bachelor of Science, and that for at least three years he has been in responsible charge of engineering work. Responsible charge in engineering teaching may be considered as responsible charge of work. In determining the acceptability of the engineering experience of the candidate the committee will be guided by the character of his professional work and the degree of responsibility involved, and will take into consideration such evidences of professional ability and growth as may be shown by his investigation of engineering problems, his contributions to technical literature, and his membership and activity in engineering societies.

If the professional experience of the candidate is accepted he must submit for approval, prior to December 31, an outline of his proposed thesis. The completed thesis, in the form prescribed in the "Instructions for the Preparation of Masters' and Doctors' Theses," must be deposited with the Dean of the College of Engineering not later than May 1. The candidate must present himself at commencement in order to receive the degree.

A candidate for a professional engineering degree must pay the incidental fee of seventy dollars on being notified that his professional experience is accepted as qualifying him to enter as a candidate for the degree. No one will be enrolled as a candidate for the degree at the following commencement who does not pay his fee at this time. When a candidate for a professional engineering degree has once been accepted and paid his fee, he is eligible to receive the degree at any time within five years, without additional fee, on completion of the requirements; provided, however, that unless he completes the requirements within two years his name will be dropped from the list of candidates and in order to receive the degree within the five-year period he must register once more.

The Degree of Doctor of Philosophy

Major and Minor Subjects.—A member of the Graduate School who desires to become a candidate for the degree of Doctor of Philosophy is required

[1]Including chemical engineering.

to pursue a major subject in the department in which his research lies. He is also required to choose one minor subject, or he may choose two. If one minor only is chosen it must be taken in a department of study other than that of the major, and credit for it may be earned by work representing not less than four units, or one-sixth of the total residence required for the doctorate. If two minors are chosen, one must be a subject closely related to the major. With the approval of the adviser it may be a division of the major field of study. The other minor (not less than two units) must, in that case, be taken in a department of study other than that of the major.

Except by special permission of the Dean the preliminary examination in major and minor subjects may not be taken until the minor work has been done.

Method of Computing Residence.—Credit for a full year of graduate work means that the student has during that time devoted all his working time and energy to study of a graduate grade. After the first year of residence, credit is not recorded in units, and there is no fixed correspondence between credit and courses as in undergraduate work. Thus it is possible for a second-year student to devote all his time to one course and his research; and for a third-year student to devote all his time to his research alone.

Period of Study.—The *minimum* period of study required for securing the degree of Doctor of Philosophy is three years, during which the student is required to devote all his working time to his studies. All three years must be spent in resident graduate study at some accredited educational institution and either the first two or the last one of the three must be spent at the University of Illinois. The degree is conferred, however, not for residence during a certain period, but for scholarly attainments and power of investigation, as proved by a thesis and examinations.

Work Done in Other Universities.—Credit for graduate work done in other universities is not "transferred." However, it may be accepted on examination as equivalent to resident work at the University of Illinois, provided the institution in which it was done is of high standing.

Preliminary Examinations.—

A. In Languages.—The student will be required to demonstrate his ability to read French and German and other languages needed in his work. (In special cases the Executive Faculty, upon recommendation of the student's adviser, may substitute for either one of the languages usually required some other language which can be shown to be more useful in that student's professional research.) No student will be permitted to acquire residence towards the second year of graduate study until he has passed the examination in at least one of these languages. Both the examination in French and that in German must be passed before the student is admitted to the preliminary examination in his major and minor subjects. For the dates of these language examinations consult the calendar at the beginning of this bulletin. Application for admission to these examinations must be made a week, at least, in advance of the date of the examination.

B. In Major and Minors.—Towards the end of his second year of study, or by special permission, at the beginning of this third year (not later than the first Saturday in October), a student who wishes to become a candidate for the degree must submit to a preliminary examination. This examination is intended

to test the student's knowledge of the fields of his major and minor subjects of study only. It is partly oral, and may be wholly so.

The student will not be admitted to his preliminary examination until the faculty is satisfied that he has finished substantially the equivalent of two years' graduate work. He must do a full year's graduate work between his preliminary examination and the completion of his work for the doctorate.

Final Examination.—At least two weeks before the time when the degree is conferred, the candidate must submit to a final examination, given by a committee appointed by the Dean. This examination is primarily on the research work of the student, as embodied in his thesis, but it is not confined to that. It extends to the whole field of study of the candidate. It will not be confined to the courses which the candidate has attended in the University of Illinois only, if he has done part of the work elsewhere; nor even to the field covered by the courses specifically taken in this or other universities; but will be so conducted as to determine whether the candidate has a satisfactory grasp of his major subject as a whole, and a general acquaintance with the fields of knowledge represented by his course of study.

The final examination may not be divided. The examination must be taken all at one time even though it requires several sessions.

If after having passed his preliminary examination, he fails in the third year of his study to meet the expectations of the professors in charge of his work, or in any way fails to maintain the standard of scholarship and power of research expected of him, he may be refused admission to the final examination.

Other Examinations.—Before the candidate is admitted to the final examination and the defense of his thesis, he may be required to take any other examination, oral or written, that is thought proper by the various departments in which he has studied.

The above examinations are in addition to those in the courses for which the student is registered. These must be taken at the time for which they are set in the examination schedule.

Thesis.—The power of independent research must be shown by the production of a thesis on some topic connected with the major subject of study. The candidate is expected to defend his thesis or dissertation before the members of the faculty, or as many of them as may wish to question him about it, in connection with his final examination.

The subject of the thesis should be chosen not later than the end of the second year of residence and must be submitted for formal approval by the faculty not later than six weeks from the beginning of his third year of residence.

Two typewritten copies of the complete thesis, *the original on thesis paper,*[1] and the first carbon on plain paper of approximately the same weight, and in final form, must be deposited in the office of the Dean for presentation to the examining committee not later than two weeks prior to the final examination and not less than four weeks before the time when the degree is conferred. At the same time, the candidate must deposit with the Dean a manuscript of the essential part, or an abstract, or a digest of his thesis, in condition for publication at a cost not to exceed seventy-five dollars ($75). The manuscript must

[1]No other will be accepted by the Dean.

be sufficient to show the method followed, the evidence used, and the conclusions reached in the investigation, and must bear the approval of the department and the Executive Faculty of the Graduate School.

The candidate must pay to the Comptroller before graduation the sum of seventy-five dollars ($75) out of which the University will print at least one hundred copies of this manuscript for circulation by the University, unless the thesis entire or in abbreviated form is published by the author or is accepted for publication by a standard journal or publisher within a year from the date of graduation. In the latter event, and after one hundred copies have been presented to the University by the writer, the cash deposit shall be returned to him.

The typewritten and printed forms of the thesis must comply with the regulations given in "Instructions for the Preparation of Masters' and Doctors' Theses," copies of which may be obtained at the Dean's office.

Degree of Doctor of Philosophy in Engineering

The degree of Doctor of Philosophy in Engineering is offered in certain lines of academic work of a high scholastic type in engineering science for students who wish to prepare themselves as teachers, investigators, and experts.

The general requirements for this degree, as to preliminary education, linguistic attainments, etc., are the same as in other subjects.

The following lines of engineering science, or others approved by the Graduate School, may be elected as majors:

Engineering mechanics
Steam engineering
Hydraulic and sanitary engineering
Electrical engineering
Heating and ventilation engineering
Railway engineering
Masonry construction and structural engineering
Coal-mining engineering
Ceramic engineering

The first minor may be any of the above or one of the following sciences or an authorized combination of two of them:

Theoretical mechanics
Mathematics
Thermodynamics
Bacteriology
Chemistry
Geology
Physics (experimental or mathematical)
Zoology
Botany
Economics

The second minor should be in other than engineering subjects.

Agricultural and Engineering Experiment Stations

Attention is called to the unusual opportunities for graduate study in connection with the Agricultural and Engineering Experiment Stations. By under-

taking a line of graduate study in close association with some one of the projects carried on in those Stations, the student will come into contact with aspects of his specialty which he would rarely touch in a purely academic study, and he will thus broaden his outlook. The Experiment Stations make available apparatus, equipment, and the services of mechanicians, which may materially facilitate the carrying on of investigations.

Scholarships and Fellowships

A number of scholarships and fellowships have been established by the Trustees of the University. To first-year graduate students of ability and promise there are open a number of scholarships without stipends but carrying exemption from the payment of tuition, incidental, and laboratory fees. There are two classes of fellowships—University Service Fellowships and Honorary Fellowships. The first are open to second-year and third-year graduate students with stipends of $400 and $500, respectively. They are awarded on the condition that their holders shall be available for teaching, research, and other University services not to exceed one-quarter time in each case. No applicant is eligible for a $400 fellowship who has not passed the language examination in either French or German before the regular date for filing applications. To be eligible for a $500 fellowship an applicant must have passed both language examinations before the date for filing applications and must be prepared to take the preliminary examination in his major and minor subjects by the following June. Honorary Fellowships carry no stipends and no exemption from the payment of fees. Their purpose is to give recognition to superior students who are not in need of financial assistance.

Candidates for these scholarships and fellowships must be graduates of the University of Illinois, or of colleges or universities having equivalent requirements for bachelors' degrees.

Application must be made on blanks to be obtained from the Dean of the Graduate School. These application forms should be sent to the Dean of the Graduate School as early as possible in February of the academic year preceding that for which the fellowship is desired. No application will be considered if received later than March first, until after April fifteenth, the date when appointees from the first list of applications must accept or refuse their appointments.

Persons appointed are notified on April first and must send the Secretary of the Board of Trustees notice of their acceptance or refusal by April fifteenth; and must agree that, if accepted, the appointment will not be resigned to take a similar one in any other institution during the year for which it is awarded.

Nominations to fellowships are made on the grounds of worthiness of character, scholastic attainments, and promise of success in the principal line of study or research to which the candidate proposes to devote himself. Scholarships and fellowships are not given to candidates who are over thirty years of age at the time when the appointment is to be made.

The Carr Fellowship in Chemistry.—The Honorable Robert F. Carr, of the class of 1893, gave in 1919 the sum of ten thousand dollars, the income of which is to be used as the stipendium of a fellowship in chemistry or chemical engineering. The stipend is $750.

Libraries

The general university library, including the departmental libraries and reading rooms listed below, are located at the University in Urbana. The libraries of the College of Pharmacy and the College of Medicine are in Chicago.

These libraries contain about 972,000 volumes and about 243,000 pamphlets. Of these, 923,000 books and 235,000 pamphlets are in the libraries at Urbana; the rest are in Chicago. The library at Urbana also contains about 3,400 maps and 9,500 pieces of sheet music. About 8,000 periodicals are currently received, including over 200 newspapers published in Illinois and about 125 foreign language newspapers published in the United States.

The general library of the University is open daily, from 8 a. m. until 10 p. m. and on Sunday from 2:30 p. m. until 5:30 p. m.

In the book stacks are 140 cubicles for the use of faculty members and graduate students.

A number of departmental and college libraries and reading rooms are maintained in the library and in other buildings on the campus; these libraries do not necessarily contain all the books in the respective subjects. In some instances they are primarily for the use of the graduate students and advanced undergraduate students in the departments using the respective buildings. The principal departmental libraries and reading rooms are the following:

Name of Library	*Location*	*Volumes*
Philosophy, Psychology, and Education	Library Building	5,300
Classics	Library Building	25,000
Modern Languages	Library Building	7,500
English	Library Building	6,800
History and Political Science	Library Building	20,100
Economics, Sociology, and Commerce Reading Room	Library Building	3,500
Natural History	Natural History Hall	54,300
Law	Law Building	41,900
Architecture, Ricker Library of	Architecture Building	10,500
Agriculture Reading Room	New Agriculture Building	21,800
Chemistry	Chemistry Building	15,700
Physics	Physics Building	1,600
Mathematics	Mathematics Building	11,600
Engineering	Engineering Hall	32,200

The library includes most of the bibliographical aids published for the book-trade in this and other countries; a Union Card Catalog of books in seven other large American libraries; many printed catalogs of important libraries, e.g., Catalogue of Printed Books in the British Museum, Gesamtkatalog der Preussischen Bibliotheken, and Catalogue Général des livres imprimés de la Bibliothèque Nationale; and many bibliographies of special subjects.

The following brief statements indicate the resources of the library for research in a few subjects selected at random:

Official publications of municipalities number about 32,000 reports, charters and ordinances, issued by over 3,000 American and 300 foreign municipalities, and more or less complete files of about 50 municipal periodicals. Systematic attempts are made to secure current publications, especially of Illinois municipalities.

Mathematics numbers over 11,000 volumes, about 9,500 dissertations and other pamphlets, and includes files of over 300 periodicals and other serials.

Chemistry includes about 10,500 volumes of bound periodicals, 4,600 other books, 1,500 pamphlets, 7,200 theses, and receives currently 255 journals, most of which are complete sets.

Italian history includes the Cavagna Library, 40,000 volumes, pamphlets, and maps, and 138 bundles of manuscripts with typed partial index to families and places dealt with; much material of Italian local history, biography, and genealogy.

Classical literature, history, and archaeology embraces approximately 30,000 volumes, including complete sets of about 150 journals and serials; the library of Professor Wilhelm Dittenberger, of Halle, 5,600 items acquired in 1907; the library of Professor Johannes Vahlen, of Berlin, 10,000 items acquired in 1913; and a collection of about 17,000 dissertations, reprints, etc.

The Ricker Library of Architecture numbers 10,500 volumes, 12,000 lantern slides, and 9,000 photographs and drawings. It is not only a good working library for faculty and students in architecture, but contains many of the older and rarer works.

Fees and Expenses

Except as noted below, graduate students pay fees as follows:

Matriculation fee	$10.00
Incidental fee, each semester, for residents of Illinois	35.00
All students, not residents of Illinois, pay each semester an incidental fee of	62.50
Incidental fee for students registered for thesis work towards the master's degree on leave of absence	20.00
Graduation fee	10.00
For late registration	5.00
For change in study-list	1.00

All persons on University appointment or on appointment in allied surveys and laboratories in Urbana and the research and educational hospitals in Chicago, eligible for admission to University work, also superintendents, principals, and teachers employed in the public school systems of Illinois and teachers and members of the staff in colleges and universities in this state, when admitted to instruction in the University during the period of their employment, may be permitted to attend University classes for credit, on condition that they register and pay either the regular incidental fees in the Graduate School, or, at their election, fees assessed as follows:

For undergraduate and professional work in the colleges and schools at Urbana, $2.50 a credit hour.

For graduate work at Urbana or Chicago, at the rate of $10 a unit; provided, however, that persons on scholarship or fellowship appointment in the Graduate School, or on University appointment at a salary of $1,600 a year or less, who are registered in the Graduate School, shall be exempt from the payment of such fees, and from laboratory fees, in courses for graduate credit.

All persons shall pay the matriculation and graduation fees.

Table board may be obtained at prices ranging from $5 to $7 a week.

Room rent, single room, ranges from $15 to $25 a month; double room, from $10 to $15 a month, each person.

The Graduate Club

The Graduate Club is an unofficial organization of the graduate students and faculty. Its purpose is to furnish an opportunity for those working in different departments to become acquainted with one another and thus counteract the tendency toward narrowness which intense specialization may sometimes induce.

DEPARTMENTS OF INSTRUCTION

Courses open to graduate students are of two classes. The first class is wholly of graduate grade, and the courses are numbered 100 upwards. The second class includes the courses classified as for graduates and advanced undergraduates. These carry numbers below 100. The courses numbered 100 and upwards are all accepted for major credit. Those of the other group are in many cases accepted for minor credit only. This is especially true of courses which are open to juniors.

All courses have certain prerequisites for admission. Inasmuch as the prerequisite preparation may be gained at other institutions from courses differing from those offering a similar preparation at the University of Illinois, so that a statement of prerequisites as given here would not be understood elsewhere, their description is omitted altogether. However, a student who wishes to enter a particular course must satisfy the department concerned that he has had in some form the prerequisites for admission to the course.

For the convenience of first-year students the credit value of graduate courses is given in units. These values have no significance for second-year and third-year students.

The credit received for "courses for graduates and advanced undergraduates" is in accordance with the regulations of the Graduate School (see page 10).

Students are admitted to graduate standing in agriculture who have had a thorough training in the sciences underlying agriculture, and who are otherwise eligible to the Graduate School, even though their undergraduate course of study lacked to some extent the amount and kind of technical work in agriculture included in the course of study for the bachelor's degree in agriculture at the University of Illinois.

ACCOUNTANCY

A student may major in accountancy for the master's degree only. The courses may be taken for minor credit by applicants for the master's or doctor's degree in other departments with the approval of the adviser. The courses in accountancy for graduates only may be selected by those who have had approximately 15 university credits in accountancy, including Accountancy 3a or its equivalent. Accountancy 4a is a prerequisite for 104; 3b for 110; 13 for 113; and 20 for 120.

The courses for graduates and advanced undergraduates may be taken by those who have had the equivalent of 12 university credits in accountancy.

Courses for Graduates

103. Advanced Theory and History.—Twice a week; both semesters. *One unit.* Professor Littleton.

104. Accounting Systems.—Twice a week; both semesters. *One unit.* Professor Scovill.

113. Governmental Accounting.—Twice a week; second semester. *One unit.* Professor Morey.

120. Income Tax Development.—Twice a week; first semester. *One unit.* Professor Filbey.

129. Thesis.—Once a week; both semesters. *One unit.* Professor Littleton and members of the staff.

Courses for Graduates and Advanced Undergraduates

3a. Advanced Accounting.—Three times a week; either semester. Professors Filbey, Littleton.

3b. Auditing.—Three times a week; either semester. Professor Filbey.

4a. Cost Accounting.—Twice a week; either semester. Professor Schlatter.

4b. Accounting Systems.—Twice a week; either semester. Assistant Professor Baily.

5a–5b. C.P.A. Problems.—Three times a week; both semesters. Professor Scovill.

13. Governmental Accounting.—Twice a week; either semester. Professor Morey, Dr. Hackett.

20. Income Tax Procedure.—Twice a week; second semester. Professor Filbey.

30. Budgets and Accounting Control.—Three times a week; either semester. Associate Professor Theiss.

AGRICULTURAL ECONOMICS

Graduate students in agricultural economics may do their work in the general field of agricultural economics or specialize in any one of the following: (1) farm organization and management; (2) land economics; (3) agricultural marketing; and (4) agricultural prices and statistics.

Graduate work in agricultural economics as a major subject is open to students under either of two conditions: (1) the student must have done at least 20 hours of undergraduate work in economics, agricultural economics, business organization and operation, accountancy, history, political science, or sociology, of which at least 12 hours must have been in the field of economics and agricultural economics; or (2) the student must have had a thorough training in the principles of agricultural economics consisting of at least 12 hours credit in economics and agricultural economics, either in connection with or in addition to a course of study in agriculture substantially equivalent to that required for the bachelor's degree in agriculture in this University.

To take agricultural economics as a minor, the student must have had at least 20 hours work in agricultural and economic subjects. Two units in agricultural economics will be accepted as satisfying this requirement.

Graduate students who are making agricultural economics their major are required to take at least one course in advanced economic theory. Where such students are taking two minors in other departments, one of them must be in economics, business organization and operation, accountancy, sociology, history, or political science.

Certain courses given in other departments are closely related to those in agricultural economics. A graduate student whose major is in agricultural eco-

nomics may be permitted, on approval of the departments concerned, to take such courses as part of his major work. Attention is called to graduate courses in economics, transportation, accountancy, business organization and operation, and sociology, as well as those in other departments in the College of Agriculture.

Courses for Graduates

109. Seminar. Thesis Course.—All graduate students majoring in Agricultural Economics must register in Agricultural Economics 109; credit is conditional upon the completion of an acceptable thesis. Once a week; both semesters. *One to two units.* Members of the department.

110. Theory of Agricultural Economics.—Twice a week; both semesters. *One unit.* Associate Professor Stewart.

111. Agricultural Prices and Statistics.—Twice a week; both semesters. *One unit.* Assistant Professor Norton.

112. Agricultural Economics Research.—Credit is conditional upon the completion of an acceptable report of investigation. Once a week; both semesters. *One to two units.* Associate Professor Stewart.

120. Farm Management Principles and Investigational Methods.—Twice a week; both semesters. *One unit.* Professor Case.

135. Marketing Fruits and Vegetables.—Once a week; first semester. *One to two units.* Professor Lloyd.

Courses for Graduates and Advanced Undergraduates

10. Economic Relationships of Agriculture.—Three times a week; first semester. Assistant Professor Norton.

14. Cooperation in Agriculture.—Twice a week; second semester. Dr. Bartlett.

15. Financing Agriculture.—Three times a week; second semester. Assistant Professor Norton.

17. Economic History of Agriculture.—Twice a week; first semester. Assistant Professor Norton.

18. Land Economics.—Three times a week; second semester. Associate Professor Stewart.

22. Types and Systems of Farming.—Required field trip, expense about $3. Three times a week; first semester. Professor Case.

23. Farm Business Analysis.—Required field trip, expense about $10. Three times a week; second semester.

24. Farm Operation.—Required field trip, expense about $3. Twice a week; first semester.

25. Farm Organization.—Required field trip, expense about $10. Three times a week; second semester. Professor Case.

26. Farm Administration.—Twice a week; first semester. Professor Case.

31. Grain Grading and Marketing.—Required inspection trip, expense about $15. (Not given in 1934-35.) Three times a week; second semester. Associate Professor Pieper.

34. Marketing Dairy Products.—Twice a week; second semester. Dr. Bartlett.

36. Marketing Horticultural Products.—For seniors and graduates specializing in horticulture. Inspection trip required; estimated cost, $12. Three times a week; first semester. Professor Lloyd.

37. Marketing Livestock.—The class will visit a terminal livestock market; estimated cost of the trip, $18. Twice a week; second semester. Associate Professor Ashby.

41. Problems in Agricultural Economics.—Once a week; both semesters.
    (a) Agricultural Marketing.—Members of the department.
    (b) Agricultural Prices and Statistics.—Assistant Professor Norton.
    (c) Farm Organization and Management.—Professor Case.
    (d) Land Economics.—Associate Professor Stewart.

42. Farm Appraisals.—Local field trips to be arranged; estimated cost, $5. Four times a week; second semester. Members of departments involved.

AGRONOMY

Graduate students may take work in agronomy leading to the M.S. and Ph.D. degrees. They may specialize for either degree in soil fertility, soil physics, soil biology, plant breeding, or crop production.

For either degree, if two minors are chosen, the first should be, and both first and second may be, taken in a department other than agronomy. If only one minor is chosen, it must be in a field outside of the department.

A candidate for the master's degree in agronomy must present an acceptable thesis, and show proficiency in his work as demonstrated by suitable examinations, prescribed by the department.

Fifteen college credits in agronomy and related subjects are prerequisites for a minor, and five additional credits are prerequisites for a major. Students must have had the fundamental work in science, prerequisite to the major and minor fields of study. Those with unusually good training in science may be permitted by the department to waive certain of the above mentioned requirements.

Courses for Graduates

101. Chemical Properties of Soils and Their Relation to Plant Growth.—Twice a week; first semester. *One unit.* Professor DeTurk.

104. Seminar.—Once a week; both semesters. *One-fourth unit.* (Not given in 1934-35.) The Graduate Staff.

112. Theory and Analysis of Plant Breeding Problems.—Three times a week; first semester. *One unit.* Professor Woodworth.

114. Principles Underlying the Production of Crops.—Twice a week; second semester. *One unit.* Professor Burlison, Associate Professor Dungan.

118. Research.—A special problem is chosen by each student. Graduate students writing theses should so indicate in registering in Agronomy 118. Both semesters. *One-half to four units.*
    (a) Soils.—Professors Bauer, DeTurk, R. S. Smith.
    (b) Crops.—Professors Burlison, Woodworth, Associate Professor Dungan.

119. Experiment Station Problems.—See Animal Husbandry 103.

Courses for Graduates and Advanced Undergraduates

7. Crop Production as Affected by Environmental Factors.—Three times a week; first semester. Professor Burlison, Associate Professor Dungan.

10. Genesis, Morphology, Classification, and Geography of Soils.—Three times a week; second semester. Professor R. S. Smith.

11. Rôle of Micro-organisms in Soil Fertility.—Three times a week; first semester. Associate Professor Sears.

13. Soil Productivity, its Variation, Modification, and Maintenance.—Three times a week; second semester. Professor Bauer.

22. Plant Genetics and Breeding.—Three times a week; second semester. Professor Woodworth, Dr. Bonnett.

29. Field Plot Technic.—Three times a week; first semester. Professor Woodworth, Mr. Mumm.

30. Metabolism of Soil Micro-organisms.—Three times a week; second semester. (Given in alternate years; not given in 1934-35.) Associate Professor Sears.

31. Biological Methods of Soil Investigation.—Three times a week; second semester. (Given in 1934-35 and in alternate years.) Associate Professor Sears.

32. Physical Methods of Soil Investigation.—Three times a week; first semester. (Given in 1934-35 and in alternate years.) Dr. Stauffer.

33. Chemical Methods of Soil Investigation.—Three times a week; first semester. (Given in alternate years; not given in 1934-35.) Professor DeTurk.

ANIMAL HUSBANDRY

The department of animal husbandry offers graduate work leading to the degree of Master of Science and the degree of Doctor of Philosophy. For a major or minor for the master's degree the student may specialize in the general field of animal production, or in the special fields of animal genetics, animal nutrition, animal pathology and poultry husbandry. For a major or minor for the doctor's degree he may specialize in animal genetics, the economics of meat production, animal nutrition, and animal pathology. Advanced work in poultry husbandry may be taken for a minor for the doctor's degree.

For registration for a minor in animal husbandry a student must offer at least 15 college credits in the field, including the principles of feeding, the principles of genetics, livestock production and livestock judging, and he must have had an introductory course in organic chemistry. For a major a student must offer at least 5 additional college credits in animal husbandry or in courses related to the major field of specialization. Besides these general requirements, a student must have had the special training required for effective graduate study in the field of his chosen major: For work in animal production, the economics of meat production; for work in poultry husbandry, an introductory course in farm management; for work in animal genetics, at least an introductory course in general zoology; for work in animal nutrition, a satisfactory course in quantitative chemical analysis, and preferably also a course in animal physiology; for work in animal pathology, training in histology, physiology, bacteriology, and hygiene. Attention is also directed to the advisability of including in undergraduate preparation for graduate work in any phase of animal husbandry at least introductory training in French or German and in mathematics.

In the case of students with an unusually thorough training in science who wish to pursue graduate work in some special field of animal husbandry from a non-agricultural viewpoint, the department may waive certain of the above requirements.

Students who desire to become candidates for the doctorate and who register for a minor in the general fields of animal production or the economics of meat production must take Animal Husbandry 7 and 41, if they have not taken these courses or their equivalents during their undergraduate training. Such students registering for a major in these general fields must take in addition Animal Husbandry 31, and most students so majoring will find it desirable to register in Animal Husbandry 35.

Courses for Graduates

103. Experiment Station Problems.—Organization and administration of research; objects, methods, and the sources of error in experimental work. Open to graduate students in all the departments of the College of Agriculture. Once a week; second semester. *One-half unit.* Professor Mumford.

112. Research.—Investigations along the following lines:
   (a) Economic Factors Involved in Meat Production.—Professors Rusk, Carroll.
   (b) Systems of Livestock Farming.—Professor Case.
   (c) Animal Pathology.—Professor Graham.
   (d) Animal Nutrition.—The chemistry of feeding stuffs; metabolism experiments and biochemical studies connected with the nutrition of farm animals. Professor Mitchell.
   (e) Animal Genetics.—Associate Professor Roberts.
   (f) Problems in Poultry Husbandry.—Professor Card.

   One to three times a week; both semesters. *One-half to two units.* These courses may be taken during the summer by special permission.

117. Animal Genetics.—Two to three times a week; both semesters. *One unit.* Associate Professor Roberts.

118. Animal Nutrition Seminar.—A review of current literature in animal nutrition. Two hours a week; both semesters. *One-half unit.* Professor Mitchell.

119. Laboratory Methods in Animal Nutrition.—Two to five times a week; both semesters. *One-half to one unit.* Professor Mitchell.

120. Laboratory Methods in the Diagnosis of Animal Diseases.—Two to five times a week; both semesters. *One-half to one unit.* Professor Graham.

121. Laboratory Methods in Animal Genetics.—Two to five times a week; both semesters. *One-half to one unit.* Associate Professor Roberts.

Courses for Graduates and Advanced Undergraduates

7. Principles of Animal Nutrition.—Five times a week; first semester. Mr. Hamilton.

22. Advanced Stock Judging.—Five times a week; first semester. Members of the department.

24. Meat Judging and Special Problems.—Once a week; first semester. Associate Professor Bull.

25. Beef Production.—Three times a week; first semester. Professor Rusk, Associate Professor Snapp.

26. Pork Production.—Three times a week; first semester. Professor Carroll.

27. Sheep Husbandry.—Twice a week; second semester. Assistant Professor Kammlade.

28. History of Breeds of Livestock.—Three times a week; second semester. Professor Edmonds and other members of the department.

31. Advanced Course in Animal Nutrition.—Three times a week; second semester. Professor Mitchell.

33. Horse Production.—Three times a week; second semester. Professor Edmonds, Mr. Crawford.

35. Animal Hygiene and Sanitation.—Twice a week; second semester. Professor Graham.

39. Poultry Production.—Three times a week; second semester. Professor Card.

40. Economics of Poultry Keeping.—Three times a week; first semester. Professor Card.

41. Animal Genetics.—Three times a week; second semester. Associate Professor Roberts.

ARCHITECTURE AND ARCHITECTURAL ENGINEERING

The prerequisite for graduate work in the Department of Architecture is the equivalent of the undergraduate courses required at the University of Illinois for the bachelor's degree in the department in the branches of the subjects in which registration is desired.

Courses for Graduates

101. Architectural Construction.—Theory and design. Twice a week; both semesters. *One-half to two units.* Professor Palmer.

103. Architectural Construction.—Special problems. Twice a week; both semesters. *One-half to two units.* Associate Professor Morgan.

104. Architectural Design.—Advanced course. Twice a week; both semesters. *One to three units.* Professor Deam.

105. Architectural Practice.—Research in special topics. Once a week; both semesters. *One-fourth to one-half unit.* Professor Provine.

106. Architectural History.—Special research. Twice a week; both semesters. *One-half to two units.* Professor Newcomb.

ASTRONOMY

The prerequisites for graduate study in astronomy are mathematics through calculus, a year's course in descriptive astronomy, and a course in college physics.

Courses for Graduates

101. Seminar.—Three times a week; both semesters. *One unit.* Professor Baker.

103. Celestial Mechanics.—Three times a week; both semesters. *One unit.* Professor Baker.

Courses for Graduates and Advanced Undergraduates

9. Astrophysics.—Three times a week; first semester. Professor Baker.

15. Geodetic Astronomy.—Three times a week; second semester. Professor Baker.

BACTERIOLOGY

Students electing bacteriology as a major study must have had at least 10 semester hours of bacteriology and 15 semester hours of some other physical or biological science. Before receiving a degree a student must have had work equivalent to courses 20, 8, 26, 103, and 107; candidates for the doctor's degree will be held responsible for a general knowledge of the subject as applied to plant pathology, dairy husbandry (dairy bacteriology), and soil biology. Courses in these subjects are listed under their respective departments and will be counted, after conference with adviser, toward the requirements for the doctor's degree.

In addition to the usual examinations in courses, each candidate for the master's degree will be required to pass a general written examination toward the close of the second semester of residence.

Candidates for the doctor's degree with a major study in another field than bacteriology, who elect a first or second minor in bacteriology, must offer a minimum of three units for the first minor and two and one-half units for the second minor selected from the courses offered in this department, or, for satisfactory reasons, certain courses in the departments mentioned above. These courses must include course 103 and one advanced laboratory course in the department of bacteriology.

NOTE: The attention of students is called also to courses in bacteriology offered in other departments. Certain of these courses must be elected toward requirements for advanced degrees after conference with adviser.

Courses for Graduates

103. PHYSIOLOGY OF BACTERIA.—Twice a week; first semester. *One unit.* Professor TANNER.

107. RESEARCH.—For those students who are taking a major in bacteriology either for the doctor's degree or master's degree. Both semesters. *One-half to four units.* Professor TANNER, Assistant Professor WALLACE.

118a–118b. CURRENT LITERATURE.—Required of all graduate students majoring in bacteriology. Once a week; both semesters. *One-fourth unit.* Professor TANNER.

Courses for Graduates and Advanced Undergraduates

8. FOOD BACTERIOLOGY.—Water, sewage, and food bacteria. Five times a week; second semester. Professor TANNER and assistant.

10. EPIDEMIOLOGY.—Twice a week; second semester. Assistant Professor WALLACE.

20. GENERAL BACTERIOLOGY.—For seniors and graduate students. Five times a week. Assistant Professor WALLACE.

26. PATHOGENIC BACTERIOLOGY AND IMMUNOLOGY.—Five times a week; first semester. Assistant Professor WALLACE.

BOTANY

Candidates for advanced degrees in botany must offer for admission at least 20 hours in botany inclusive of courses 2 or 12 and 3, or 15 hours in botany and 5 hours in a related subject acceptable to the department. Graduate students who elect botany for minor credit must offer 15 hours in botany, or 10 hours in botany and 5 hours in a related subject acceptable to the department.

The department wishes to call the attention of graduate students to courses in agronomy and soils, bacteriology, chemistry, entomology, geography, geology, horticulture, mathematics, physics, physiology, and zoology which are available to advanced students and offer a broad foundation for the different phases of botanical work. The practical work in plant sciences in the College of Agriculture and the Experiment Station offers unusual facilities to the graduate student. Joint majors may be arranged in botany and agronomy.

Courses for Graduates

110. Botanical Discussions.—Required of all students and of members of the instructional staff. Once a week; both semesters. No credit.

112. Discussions in Plant Morphology.—Once a week; both semesters. *One-fourth unit.* Professor Buchholz.

113. Discussions in Physiology.—Once a week; both semesters. *One-fourth unit.* Professor Hottes.

117. Discussions in Pathology and Mycology.—Once a week; both semesters. *One-fourth unit.* Professor Stevens.

118. Discussions in Plant Ecology and Plant Geography.—Once a week; both semesters. *One-fourth unit.* Associate Professor Vestal.

Research Courses

120. Morphology.—Once or twice a week; both semesters. *One-half to two units.* (Botany 112 to be taken concurrently.) Professor Buchholz.

130. Physiology.—Once or twice a week; both semesters. *One-half to two units.* (Botany 113 to be taken concurrently.) Professor Hottes.

170. Pathology or Mycology.—Once or twice a week; both semesters. *One-half to two units.* (Botany 117 to be taken concurrently.) Professor Stevens.

180. Ecology or Geography.—Once or twice a week; both semesters. *One-half to two units.* (Botany 118 to be taken concurrently.) Associate Professor Vestal.

Courses for Graduates and Advanced Undergraduates

20. Cytology.—Once or twice a week; second semester. (Given in alternate years. Not given in 1934-35.) Professor Buchholz.

33. Physiology.—Growth, and the effect of environment on growth. Once or twice a week; first semester. Professor Hottes.

34. Physiology.—Respiration, and the effects of the environment and food on energy release. Once or twice a week; second semester. Professor Hottes.

41. Cryptogamic Botany.—Algae, Fungi, and Bryophytes. Once or twice a week; second semester. Professor Stevens and Dr. Hague.

43. Pteridophytes.—Comparative morphology. Once or twice a week; first semester. (Given in 1934-35 and in alternate years.) Professor Buchholz.

44. Spermatophytes.—Comparative morphology. Once or twice a week; second semester. (Given in 1934-35 and in alternate years.) Professor Buchholz.

45. Histology, Anatomy, and Technique.—Once or twice a week; first semester. Professor Buchholz.

46. Heredity and Evolution.—The cell in inheritance, environment, adaptation, and evolution. Once or twice a week; first semester. (Given in alternate years. Not given in 1934-35.) Professor Buchholz.

56. Plant Geography.—Regional divisions of the continents; plant vegetation of each region in relation to climate, soil, and topography. Once or twice a week; first semester. Associate Professor Vestal.

60. Systematic Botany.—Phylogenetic study of flowering plants. Relationship of the principal orders and families, rules of taxonomy and the identification of species. Once or twice a week; first semester. (Given in 1934-35 and in alternate years.) Dr. Fuller.

70. Taxonomy of Pathogenic Fungi.—Myxomycetes, Bacteria, Phycomycetes and Ascomycetes. Once or twice a week; first semester. Professor Stevens.

77. Taxonomy of Pathogenic Fungi.—Basidiomycetes and Fungi Imperfecti. Once or twice a week; second semester. Professor Stevens.

81. Plant Ecology.—Relation to environment and distribution of individual plants and of vegetation (communities). Once or twice a week; first semester. Associate Professor Vestal.

88. Plant Communities and Environment.—Analysis of the environment complex; responses of plants; communities, including smaller units of vegetation. Once or twice a week; second semester. Associate Professor Vestal.

BUSINESS ORGANIZATION AND OPERATION

Work may be done in the field of business organization and operation for a major or a minor for the M.S. degree, and for a minor for the doctorate. To do major work in this field, the student must have completed an undergraduate curriculum equivalent to that of the College of Commerce and Business Administration. To do minor work, he must have had at least five semester hours' credit in the principles of economics, also Business Organization and Operation 1 and 2 or the equivalent. Business Organization and Operation 1 is a prerequisite for 104.

Courses for Graduates

102. Marketing Policies and Problems.—Twice a week; both semesters. *One unit.* Professor Converse.

104. Scientific Management.—A study of modern management methods and procedures, particularly as they apply to industrial enterprises. Twice a week; both semesters. *One unit.* Professor Anderson.

107. Sales Campaigns.—Twice a week; both semesters. *One unit.* Professor Russell.

129. Thesis.—Time to be arranged; both semesters. *One unit.* Professor Russell and others.

Courses for Graduates and Advanced Undergraduates

3. Retail and Wholesale Store Organization and Operation.—Three times a week; second semester. Mr. Whitlo.

4. Management in Manufacturing.—Three times a week; either semester. Professor Anderson.

7. Salesmanship.—Twice a week; either semester. Mr. Jones.

8. Advertising.—Three times a week; either semester. Professor Russell.

9. Trade and Civic Organizations.—Twice a week; second semester. Mr. Bruce.

17. Sales Management.—Twice a week; second semester. Mr. Heslip.

18. Advertising Campaigns.—Three times a week; second semester. Professor Russell.

20. Credits and Collections.—Three times a week; first semester. Mr. Huegy.

22. Marketing Research and Policies.—Twice a week; second semester. Professor Converse.

75. Management of Public Utilities.—Three times a week; first semester. Assistant Professor Gray.

BUSINESS LAW

Course for Graduates and Advanced Undergraduates

10. Law of Security Relations and Banking.—Three times a week; either semester. Associate Professor Dillavou.

CERAMIC ENGINEERING

This department offers graduate work leading to the degrees of Master of Science in Ceramics, Master of Science in Ceramic Engineering, Doctor of Philosophy in Chemistry (Ceramic Chemistry), and Doctor of Philosophy in Engineering.

The prerequisite for majoring in graduate work in ceramics or ceramic engineering is proficiency in the undergraduate courses required for the degree of Bachelor of Science in the branch of the subject in which registration is desired, or substantial equivalents.

Candidates for the degree of Doctor of Philosophy in Chemistry (Ceramic Chemistry) must have had the equivalent of at least 25 semester hours of satisfactory courses in general, analytical, physical, and organic chemistry; also calculus, one year of college physics, one semester of optical mineralogy, and at least 18 semester hours or their equivalent in acceptable ceramic courses.

Courses for Graduates

101. The Chemistry of the Compounds of Silicon.—Twice a week; both semesters. *One unit.* Professor Parmelee.

102. General Technology of the Clay Industries.—Twice a week; both semesters. *One to two units.* Professors Parmelee, Hursh, Andrews.

103. Chemistry of Silicates.—Laboratory to supplement Ceramic Engineering 101, which must precede or accompany it. Both semesters. *One to two units.* Professor Parmelee.

104. Technology of Glass.—Twice a week; second semester. *One to two units.* Professor Parmelee.

105. Methods of Ceramic Research.—Twice a week; second semester. *One unit.* Professor Parmelee.

106. Research.—Professors Parmelee, Hursh, Andrews.

Courses for Graduates and Advanced Undergraduates

5. Ceramic Bodies.—Five times a week; first semester. Professor Parmelee.

7. Structural Clay Products.—Three times a week; first semester. Professor Andrews.

8. Glass Technology.—Twice a week; second semester. Professor Parmelee.
10. Cements.—Twice a week; second semester. Professor Andrews.
11. Drying Clay Products.—Three times a week; second semester. Professor Hursh.
14. Glasses and Glazes.—Three times a week; second semester. Professor Parmelee.
16. Enamels.—Three times a week; first semester. Professor Andrews.
18. Ceramic Microscopy.—Three times a week; first semester. Mr. Thompson.
20. Refractory Materials.—Twice a week; second semester. Professor Andrews.
22. Kilns and the Burning of Clay Products.—Three times a week; first semester. Professor Hursh.
23. Dryer and Kiln Design.—Twice a week; first semester. Professor Hursh.
24. Ceramic Engineering Design.—Three times a week; second semester. Professor Hursh.
28. Pyrochemical Problems.—Twice a week; second semester. Professor Andrews.

CHEMISTRY

Graduate students whose major subject is in some department other than chemistry, before taking graduate work for credit in this department, must have had the equivalent of 15 university credits in chemistry, and the ground covered should include satisfactory work in general chemistry and in qualitative and quantitative analysis and elementary organic chemistry. Such students are advised to make selections from the following courses: Chemistry 40, 41, 42, 43, 27, 36b and 37b, 50a, 60a, 15a, 16a and 97b. Courses of a more special nature will not as a rule be accepted for graduate work unless preceded by one of the courses above. Graduate students who are candidates for an advanced degree in chemistry must have had the equivalent of 25 university credits in chemistry properly distributed.

Graduate students whose major subject is in some department other than chemistry and who intend to take a first minor in chemistry or any branch of chemistry toward the Ph.D. degree must include among the courses taken, Chemistry 40 and 41, or must have had the equivalent.

Graduate students who are candidates for the A.M. or M.S. degree in chemistry must include in the courses taken Chemistry 40 and 41 or must have had the equivalent. Graduate students who are candidates for the Ph.D. degree in any branch of chemistry must include among their courses Chemistry 40, 41, 42, and 43 or must have had the equivalent.

Students who intend to take graduate work in chemistry should include in their undergraduate preparation at least the equivalent of one full year of physics, one year of French, one year of German, mathematics through differential and integral calculus. Any student without these subjects may enter the Graduate School but will be required to spend part of his time in residence on the above-mentioned subjects.

Courses for Graduates

Inorganic Chemistry

101a–101b. Inorganic Chemistry.—The less familiar elements and their relationship in the periodic system. Lectures; recitations. Twice a week; both semesters. *One-half unit.* Professor Hopkins.

102a–102b. Inorganic Chemistry.—(Laboratory.) Inorganic preparations and qualitative analysis of the less familiar elements. To accompany or follow Chemistry 101a–101b. One to three times a week; both semesters. *One-fourth to three-fourths unit.* Professor Hopkins.

105a-105b. Inorganic Chemistry.—(Seminar and Special Topics.) Current literature; special topics for 1934-35: First semester, Non-aqueous Solvents as Media for Chemical Reactions. (Dr. Audrieth). Second semester, The Influence of Atomic Radii and Atomic Volumes on Chemical Properties. (Dr. Quill.) One, two, or three times a week; both semesters. *One-fourth to one unit.* Professor Hopkins.

Qualitative and Quantitative Analysis

123a. Qualitative Analysis.—The principles and methods of analytical chemistry; theory of solutions. Lectures. Twice a week; first semester. *One-half unit.* Associate Professor Reedy.

123c. Qualitative Analysis.—Laboratory work, optional, to accompany Chemistry 123a. One to three times a week; first semester. *One-fourth to three-fourths unit.* Associate Professor Reedy.

124b. Quantitative Analysis.—A modern survey of advanced principles, calculations, experimental methods and applications. Lectures. Twice a week; second semester. *One-half unit.* Associate Professor Reedy.

124d. Quantitative Analysis.—Laboratory work, optional, to accompany Chemistry 124b. One to three times a week; second semester. *One-fourth to three-fourths unit.* Assistant Professor Smith.

125a–125b. Quantitative Analysis.—(Seminar). Special topics in analytical chemistry. (Required of all students taking a major or minor in analytical chemistry.) One to three times a week; both semesters. *One-fourth to one unit.* Professor Clark.

126a. Quantitative Instrumental and Chemical Methods of Analysis in Chemical Research.—(Ultimate bomb analysis, gas density, polarimetry, refractometry, spectrophotometry, colorimetry, microscopy, etc.) Lectures. Twice a week; first semester. *One-half unit.* Assistant Professor Englis.

126c. Quantitative Instrumental and Chemical Methods of Analysis in Chemical Research.—Laboratory work, optional, to accompany Chemistry 126a. One to three times a week; first semester. *One-fourth to three-fourths unit.* Assistant Professor Englis.

127a–127b. Modern Applications of X-rays in Chemical and Industrial Problems.—Lectures. Twice a week; both semesters. *One-half unit.* Professor Clark.

127c–127d. Modern Applications of X-rays in Chemical and Industrial Problems.—Laboratory, optional, to accompany Chemistry 127a–127b. One to three times a week; both semesters. *One-fourth to one-half unit.* Professor Clark.

Organic Chemistry

132a. Organic Chemistry.—(First course.) Review of the general reactions in organic chemistry. Problems. Twice a week; first semester. *Three-fourths unit.* Associate Professor Shriner.

133b. Organic Chemistry.—Optical isomerism; geometric isomerism; tautomerism, etc. Twice a week; second semester. *Three-fourths unit.* Professor Adams.

134. Organic Chemistry.—(Laboratory.) Advanced preparations are selected to meet the needs of each individual in the course. Two to four times a week; both semesters. *One-half to one unit.* Professor Marvel, Associate Professor Shriner.

135a–135b. Organic Chemistry.—(Seminar.) Current literature. (Required of all students majoring in organic chemistry.) Once a week; both semesters. *One-fourth unit.* Professor Adams.

136a. Organic Chemistry.—Special topics. Twice a week; first semester. *Three-fourths unit.* Professor Fuson.

Physical Chemistry

145a–145b. Physical Chemistry.—(Seminar.) Recent development in physical chemistry. Twice a week; both semesters. *Three-fourths unit.* Professor Rodebush and staff.

Physiological Chemistry

150b. Physiological Chemistry.—Chemistry of intermediary metabolism. Lectures; discussions; readings. Twice a week; second semester. *Three-fourths unit.* Professor Rose.

152a–152b. Physiological Chemistry.—Difficult biochemical preparations; chiefly laboratory. One to five times a week; both semesters. *One-half to one unit.* Professor Rose.

155a–155b. Physiological Chemistry.—(Seminar.) Current literature. (Required of all students majoring in physiological chemistry.) Twice a week; both semesters. *Three-fourths unit.* Professor Rose.

Chemical Engineering

160a–160b. Advanced Chemical Technology, and Chemical Engineering.—Recent developments in the chemical industry. Lectures. Twice a week; both semesters. *One-half unit.* Professor Keyes.

161a–161b. Chemical Plant Design.—Calculations and layout of equipment for recently developed processes. Twice a week; both semesters. *One-half unit.* Associate Professor Krase.

Sanitary Chemistry

186a–186b. Sanitary Chemistry.—Special problems and new developments in sanitary chemistry. Twice a week; both semesters. *One-half to one and one-fourth units.* Professor Buswell.

Miscellaneous

190a–190b. Research.—A thesis is usually required of students taking the master's degree and is always required of students taking the degree of Doctor of Philosophy. Both semesters. Work may be taken in the following subjects:

Physical and Electrochemistry.—Professor Rodebush, Associate Professor Phipps, Dr. Copley.

Inorganic Chemistry.—Professor Hopkins, Associate Professor Reedy, Drs. Audrieth, Bailar, Copley, Quill.

Analytical Chemistry.—Professor Clark, Associate Professor Reedy, Assistant Professors Englis, Smith.

Applied X-rays.—Professor Clark.

Food Chemistry.—Assistant Professor Englis.

Phyto-Chemistry.—Assistant Professor Englis.

Organic Chemistry.—Professors Adams, Marvel, Fuson, Associate Professor Shriner, Dr. Bailar.

Sanitary Chemistry.—Professor Buswell.

Zymo-Chemistry.—Professor Buswell.

Physiological Chemistry.—Professor Rose.

Chemical Engineering.—Professor Keyes, Associate Professor Krase, Assistant Professor Kistler.

Ceramic Chemistry.—Professor Parmelee.

Courses for Graduates and Advanced Undergraduates

Inorganic Chemistry

15a. Inorganic Chemistry.—The common elements; periodic relationship; preparation and application of the common elements and compounds. Lectures; recitations. Twice a week; first semester. Dr. Bailar.

16a. Inorganic Chemistry.—(Laboratory.) Preparation of the less easily produced inorganic compounds. Twice a week; first semester. Dr. Audrieth.

Qualitative and Quantitative Analysis

27. Special Methods and Instruments in Quantitative Analysis.—Three times a week; both semesters. Assistant Professor Smith.

29b. Food Analysis.—Quantitative organic analysis of food products; alcohols, carbohydrates, fats and oils, cereals, nitrogenous bodies, preservatives, and colors. Six times a week; second semester. Assistant Professor Englis.

Organic Chemistry

36b. Organic Chemistry.—(Second course.) Three times a week; second semester. Professor Marvel.

37b. Organic Chemistry.—(Laboratory.) (Second course.) Organic synthesis. To accompany Chemistry 36b. Twice a week; second semester. Professor Fuson.

38a. Qualitative Organic Analysis.—Identification of pure organic compounds and mixtures. Twice a week; first semester. Professor Marvel.

Physical Chemistry

40. Elementary Physical Chemistry.—Three times a week; both semesters. Professor Rodebush, Associate Professor Phipps.

41. Elementary Physical Chemistry.—(Laboratory.) To accompany Chemistry 40. Once a week; both semesters. Professor Rodebush, Associate Professor Phipps and assistants.

42. Elementary Physical Chemistry.—Three times a week; both semesters. Associate Professor Phipps.

43. Elementary Physical Chemistry.—(Laboratory.) Once a week; both semesters. Associate Professor Phipps and assistants.

44a–44b. Advanced Physical Chemistry.—Thermodynamics and free energy calculations. Atomic structure. Twice a week; both semesters. Professor Rodebush, Associate Professor Phipps.

49b. Chemistry of Colloids.—Preparation and properties of colloids. Special apparatus and technique employed in colloid chemistry. Three times a week; second semester. Professor Buswell.

Physiological Chemistry

50a. Physiological Chemistry.—Proteins, fats, and carbohydrates; tissues, digestion, intestinal putrefaction, and feces; quantitative analysis of gastric contents, blood, milk, and urine. Lectures; laboratory. Five times a week; first semester. Professor Rose, Dr. Carter, and assistants.

51b. Problems of Metabolism.—Micro-methods of blood and urine analysis, and their application. Lectures; laboratory. Three times a week; second semester. Dr. Carter and assistants.

Chemical Engineering

60a. Chemical Technology.—The survey of important processes and recent developments in the chemical industry; inspection trip. (Estimated cost of this trip is $30 to $35 per student.) Laboratory. Four times a week; first semester. Assistant Professor Kistler.

61a.–61b. Principles of Chemical Engineering.—The application of scientific principles to the unit operations of chemical engineering. Lectures; laboratory. Four times a week; both semesters. Associate Professor Krase, Assistant Professor Kistler, Mr. Howard.

62a–62b. Principles of Research and Development.—The fundamental methods used in the research and development departments in chemical industry; economic problems. Twice a week; both semesters. Professor Keyes.

63b. Fuels and Their Combustion.—Three times a week; second semester. Mr. Howard.

64b. High Pressure Reactions.—Technique and calculations. Twice a week; second semester. Associate Professor Krase.

65b. Chemical Engineering Calculations.—Three times a week; second semester. Assistant Professor Kistler.

71a. Sampling, Grinding, and Mixing.—Principles and calculations. Once a week; first semester. Mr. Howard.

73a. Metallurgy.—Manufacture of iron and steel. Three times a week; first semester. Mr. Howard.

74b. Metallurgy and Metallography.—General metallurgy of iron and steel; physical characteristics and microstructure of metals and alloys. Lectures; laboratory. Three times a week; second semester. Mr. Howard.

Sanitary Chemistry

86a. Chemistry of Sanitation.—Lectures, demonstrations, and field trips covering the field of water purification, sewage treatment, and general sanitation. Three times a week; first semester. Professor Buswell.

Miscellaneous

92a. Chemical Literature and Reference Work.—Once a week; first semester. Dr. Bartow.

95a. History of Science with Particular Reference to Chemistry.—Lectures; reading. Twice a week; first semester. Dr. Bartow.

CIVIL ENGINEERING

The prerequisite for graduate work in civil engineering is the equivalent of the undergraduate course required for the degree of Bachelor of Science in civil engineering in the branches of the subject in which registration is desired.

Courses open to junior and senior students are open for minor credit to students majoring in other departments.

See also Theoretical and Applied Mechanics and Railway Engineering.

Courses for Graduates

101. Water Supply. — Twice a week; first semester. *One unit.* Professor Babbitt.

102. Sewerage.—Twice a week; second semester. *One unit.* Professor Babbitt.

103. Highway Engineering.—Twice a week; first semester. *One unit.* Professor Crandell.

104. Municipal Engineering.—Twice a week; second semester. *One unit.* Professor Crandell.

105. Reinforced Concrete Theory.—Twice a week; first semester. *One unit.* Professor Cross.

106. Reinforced Concrete Structures.—Twice a week; first semester. *One unit.* Professor Cross.

107. Statically Indeterminate Structures.—Twice a week; first semester. *One unit.*

108. Bridge Design.—Twice a week; second semester. *One or two units.* Professor Cross.

109. Water Purification and General Sanitation.—Twice a week; first semester. *One unit.* Professor Babbitt.

110. Sewage Disposal, Wastes Disposal, and General Sanitation.—Twice a week; second semester. *One unit.* Professor Babbitt.

112. Masonry Construction.—Twice a week; second semester. *One-half to one and one-half units.* Professor Huntington.

113. Foundations.—Once a week; first semester. *One-half unit.* Professor Huntington.

124. Steel Building Design.—Twice a week; first semester. *One unit.* Professor Huntington.

130. Hydrology.—Twice a week; first or second semester. *One unit.* Professor Pickels.

131. Water Power.—Twice a week; second semester. *One unit.* Associate Professor Doland.

140. Research.—First or second semester. *One-half to two units.* Members of the department.

198. Thesis.—First or second semester. *One to two and one-half units.* Members of the department.

Courses for Graduates and Advanced Undergraduates

67. Statically Indeterminate Structures.—The elastic theory and its applications in statically indeterminate structures. Three times a week; first semester. Professor Cross.

68. Statically Indeterminate Structures. — A continuation of course 67. Three times a week; second semester. Professor Cross.

THE CLASSICS

The Degree of Master of Arts in the Classics.—The major may be either Latin or Greek.

The Degree of Doctor of Philosophy in the Classics.—The degree is given in classical philology. Major work may be taken in either Latin or Greek, but whichever language is taken as a major, the other must be taken as a first minor.

GREEK

Preparation for first-year graduate work in Greek must include at least two years of preparatory Greek, two years of college Greek, and two years of college Latin. A reading knowledge of French and German is important for candidates in this subject. The study of history and philosophy is especially recommended.

Courses for Graduates

105. Aristotle's *Ethics*.—Twice a week; second semester. *One unit.* Professor Oldfather.

105b. Plato.—Twice a week; first semester. *One unit.* Professor Oldfather.

121. Thucydides.—Twice a week; first semester. *One unit.* Associate Professor Perry.

122. Lucian and His Age.—Twice a week; second semester. *One unit.* Associate Professor Perry.

110. Bibliography and Criticism.—(Thesis course; the same as Latin 110.) Once a week; both semesters. *One unit.* Professors Oldfather, Canter, Associate Professor Perry.

Courses for Graduates and Advanced Undergraduates

5. Herodotus and the Lyric Poets.—Three times a week; first semester. Associate Professor Perry.

7. Greek Drama: Tragedy and Comedy.—Three times a week; second semester. Associate Professor Perry.

14. Greek Composition.—Once a week; second semester. Associate Professor Perry.

18. Greek Archaeology.—Twice a week; first semester. Dr. Rapp.

LATIN

Preparation for first-year graduate work in Latin must include at least two years of preparatory Latin and four years of college Latin. A reading knowledge of French and German is important. Some acquaintance with Greek is highly desirable, and the study of history and philosophy is especially recommended.

Courses for Graduates

102. Roman Oratory.—Twice a week; first semester. *One unit.* Professor Canter.

104. Latin Palaeography.—Twice a week; first semester. *One unit.* Professor Oldfather.

110. Bibliography and Criticism.—(Thesis course; the same as Greek 110.) Once a week; both semesters. *One unit.* Professors Oldfather, Canter, Associate Professor Perry.

115. Latin Elegy.—Twice a week; second semester. *One unit.* Professor Canter.

118. The Latin Romance.—Twice a week; second semester. *One unit.* Associate Professor Perry.

Courses for Graduates and Advanced Undergraduates

18. Roman Archaeology.—Twice a week; second semester. Dr. Rapp.

23. Livy, Tibullus, and Propertius.—Three times a week; first semester. Professor Canter.

24. Ovid (*Elegy*) and Seneca (*Epistles* and *Tragedies*).—Three times a week; second semester. Professor Canter.

10. Composition.—Twice a week; second semester. Associate Professor Perry.

DAIRY HUSBANDRY

The graduate student may major in dairy husbandry for the degree of Master of Science or Doctor of Philosophy.

Candidates for advanced degrees in dairy husbandry must have had adequate training in collegiate courses in dairy husbandry. In addition, depending upon his field of specialization, the student should have had courses in the following subjects: chemistry, bacteriology, physics, economics, zoology, genetics, and mathematics.

For either degree a first minor must be taken outside the department, preferably outside the college. If a second minor is elected it may with proper approval be chosen in the department.

Courses for Graduates

101. Economic Milk Production.—Twice a week; both semesters. *One-half to two units.* Professor Fraser.

105. Dairy Manufactures.—Both semesters. *One-half to two units.* Professor Ruehe, Associate Professor Tracy.

106. Dairy Bacteriology.—Research on assigned problems. Both semesters. *One-half to two units.* Professor Prucha.

107. Dairy Chemistry.—Assigned problems. Both semesters. *One-half to two units.* Assistant Professor Overman.

108. Physiology of Lactation.—Both semesters. *One-half to two units.* Professor Gaines.

112. Research.—Graduate students writing theses should so indicate in registering in Dairy Husbandry 112. Both semesters. *One to four units.* Special problems along the following lines:

(a) Dairy Bacteriology.—Professor Prucha.

(b) Dairy Chemistry.—Assistant Professor Overman.

(c) Dairy Cattle Breeding.—Professor Yapp.

(d) Dairy Cattle Feeding.—Associate Professor Nevens.

(e) Milk Production.—Professor Gaines.

(f) Dairy Manufactures.—Professor Ruehe, Associate Professor Tracy.

113. Seminar.—Current literature in dairy bacteriology, dairy chemistry and dairy manufactures. Once a week; both semesters. *One-half unit.* Members of the Graduate Staff.

114. Seminar.—Current literature in biology of milk production. Once a week; both semesters. *One-half unit.* Professor Gaines.

Courses for Graduates and Advanced Undergraduates

4. Ice Cream Making.—Four times a week; first semester. Associate Professor Tracy, Mr. Ramsey.

5. Composition of Dairy Products.—Three times a week; second semester. Assistant Professor Overman.

7. Creamery Buttermaking and Factory Management.—Five times a week; second semester. Professor Ruehe, Mr. Tuckey.

8. Fluid Milk Plant Operations.—Three times a week; second semester. Associate Professor Tracy, Mr. Ramsey.

10. Dairy Bacteriology.—Three times a week; first semester. Professor Prucha, Assistant Professor Brannon.

14. Milk Condensing.—Three times a week; second semester. Associate Professor Tracy, Mr. Ramsey.

17. Advanced Study of Dairy Breeds.—Three times a week; first semester. Professor Yapp.

20. Economic Problems in Dairy Farming.—Three times a week; first semester. Professor Fraser.

21. Systems of Dairy Farming.—Three times a week; second semester. Professor Fraser.

25. Advanced Dairy Cattle Feeding.—Twice a week; first semester. Associate Professor Nevens.

ECONOMICS

Every student entering on major graduate work in economics must have had a course in the principles of the science and also in some special part of the field such as public finance or money and banking. The work must represent at least eight semester hours. He must have had at least one semester's work in English, American, or general European history, and at least three hours in political science.

Those who take the subject as a minor must have had a course of at least five semester hours in the principles.

Graduate students who are making economics their major are required during their first year to acquaint themselves with the works of the masters in the science, by taking either course 101 or 103. In the same or subsequent year they are expected to elect the fundamental courses in some other divisions of the field of economics. One of the minors for the doctor's degree may be taken in a separate division of economics; the other must be taken out of the department, and preferably outside of the College of Commerce.

The following courses may be taken by students in general economics for major or minor credit; all numbered above 100; 4, 10, 11, 13, 14, 15, 17, 24, 25, 29, 30, 41, 42, 43, 44, 51, 52, 55, 61, 71, 72, 81. The following may be taken for minor credit only: 8, 9, 31, 36, 56, 82.

Two units will be accepted for a first minor for the master's degree; and four two- or three-hour graduate courses, or their equivalent in advanced undergraduate courses, for a first minor for the doctor's degree.

Courses in transportation may be included in their programs by students of economics as part of their major; courses in agricultural economics, transportation, accountancy, and business organization and operation may be used to satisfy the requirements for the minor. See Business Organization and Operation, Public Utilities and Transportation, and Agricultural Economics.

Courses for Graduates

101. Economic Theory.—Twice a week; both semesters. *One unit.*

102. Theory and History of Money, Credit, and Prices.—Twice a week; both semesters. *One unit.* Assistant Professor Wasserman.

103. The Distribution of Wealth.—Twice a week; both semesters. *One unit.*

104a. Theories and Policies of International Trade.—Twice a week; first semester. *One unit.* Professor Litman.

104b. Organization of International Trade.—Twice a week; second semester. *One unit.* Professor Litman.

105. Public Finance.—Twice a week; both semesters. *One unit.* Professor Hunter.

106. International Exchange and the Money Markets.—Twice a week; second semester. *One unit.* Associate Professor Wright.

107. The Corporation in Economic Evolution.—Twice a week; both semesters. *One unit.* Assistant Professor Brown.

109. Comparison of the Theory and Practice of the Leading Central and Reserve Banks with Special Reference to England, Germany, France, and the United States.—Twice a week; first semester. *One unit.* Associate Professor Wright.

110a. Finance and Investments: Fundamental Principles Applied to Business Units of a Simple Character.—Twice a week; both semesters. *One unit.* (Not given in 1934-35.)

112. Labor Problems.—Twice a week; both semesters. *One unit.* Associate Professor Berman.

This course is arranged in a two-year cycle:

1934-35: Labor Problems; Trade Unionism; both semesters.

1935-36: Wages and Unemployment, first semester; Labor and the Law, second semester.

118. Seminar.—Thesis course. (All graduate students writing theses in economics must register in Economics 118; registration for other students is optional.)

(a) Third Year: Seminar.—Professor Litman.
(b) First Year: General Economics.—Assistant Professor Brown.
(d) First Year: Public Utilities.—Assistant Professor Gray.

120. History of Economic Thought.—Twice a week; both semesters. *One unit.*

122. International Economics and Finance.—Twice a week; both semesters. *One unit.* Professor Bogart.

123. Industrial and Financial Organization of Society.—Twice a week; both semesters. *One unit.* Professor Lee.

143. The Administration of Industrial Relations.—Twice a week; both semesters. *One unit.* Dr. Helbing.

144. Business Cycles.—Twice a week; both semesters. *One unit.* Assistant Professor Dickinson.

180. Management of Public Utilities.—Twice a week; both semesters. *One unit.* Assistant Professor Gray.

See also Mathematics 129.—Theory of Statistics.

Courses for Graduates and Advanced Undergraduates

4. History of Money and Banking Institutions, with Particular Reference to the United States.—Three times a week; first semester. Professor Lee.

8. Foreign Exchange and the Money Market.—Three times a week; second semester. Associate Professor Wright.

9. Advanced Theory and Practice of Banking.—Three times a week; first semester. Associate Professor Wright.

10. Corporation Finance and Management.—Three times a week; second semester.

11. Industrial Consolidation. — Development; plans for controlling trusts. Three times a week; first semester. Assistant Professor Brown.

23. Economic Problems.—Three times a week; second semester. Professor Lee.

24. Economic Development of Modern Europe.—Three times a week; second semester. Professor Bogart.

25. Economic History of England.—Three times a week; first semester. Professor Bogart.

29. International Commerce and Commercial Policies.—Three times a week; second semester. Professor Litman.

30. World Markets.—Three times a week; second semester. Professor Litman.

31. Organization of International Commerce.—Three times a week; first semester. Professor Litman.

36. Investments.—Three times a week; second semester. Assistant Professor Brown.

41. Labor Problems.—Three times a week; first semester. Associate Professor Berman.

42. Trade Unionism.—Three times a week; second semester. Associate Professor Berman.

43. Personnel Administration.—Three times a week; second semester. Dr. Helbing.

44. Socialism and Economic Reform.—Three times a week; first semester. Dr. Helbing.

51. Public Finance.—Three times a week; first semester. Professor Hunter.

52. Problems in Taxation, with Special Reference to Illinois.—Three times a week; second semester. Professor Hunter.

55. Economics of Insurance (Life).—Three times a week; first semester. Assistant Professor Dickinson.

56. Economics of Insurance (Property).—Three times a week; second semester. Assistant Professor Dickinson.

58. Urban Land Economics.—Three times a week; first semester. (Not given in 1934-35.) Assistant Professor Dickinson.

61. Economic Theory.—Three times a week; both semesters. Assistant Professor Wasserman.

71. Economic Statistics.—Three times a week; first semester. Assistant Professor Dickinson.

72. Economic Statistics (Business Barometers).—Three times a week; second semester. Assistant Professor Dickinson.

81. Principles of Public Utilities.—Three times a week; first semester. Assistant Professor Gray.

82. Regulation of Public Utilities.—Twice a week; second semester. Associate Professor Dillavou.

83. Public Utility Rates.—Three times a week; second semester. Assistant Professor Gray.

EDUCATION

For a master's degree in education, Education 125 is required. For students who have not taken a course in the history of education as undergraduates, Education 11 or Education 30 is required.

Education 6 and 25, or their equivalents, are required as prerequisites for all graduate courses.

Courses for Graduates

101. Philosophy of Education.—Twice a week; second semester. *One unit.* Professor Cameron.

102. Research in History of American Education.—Once a week; two hours; both semesters. *One unit.* Professor Seybolt.

104. Educational Administration.—Twice a week; both semesters. *One unit.* Associate Professor Weber.

106. High School Administration.—Once a week; two hours; first semester. *One unit.* Professor Clement.

120a. Supervision of Secondary Education.—Once a week; two hours; second semester. *One unit.* Professor Clement.

121. Educational Measurement.—Once a week; two hours; second semester. *One unit.* Associate Professor Odell.

123. Educational Statistics.—Once a week; two hours; first semester. *One unit.* Associate Professor Odell.

124. Readings in Educational Research.—Once a week; two hours; both semesters. *One unit.* Professor Monroe.

125. Educational Psychology.—Once a week; two hours; both semesters. *One unit.* Professor Cameron.

127. High-School Curricula.—Once a week; two hours; first semester. *One unit.* Professor Clement.

128. Junior High School.—Twice a week; first semester. *One unit.* Professor Clement.

129. The Junior College.—Once a week; two hours; second semester. *One unit.* Professor Clement.

131. Analysis and Evaluation of High School Texts.—Once a week; two hours; second semester. *One unit.* Professor Clement.

147. Psychology of Elementary School Subjects.—Once a week; two hours; first semester. *One unit.* Professor Cameron.

148. Psychology of High School Subjects.—Once a week; second semester. *One unit.* Professor Cameron.

150. Thesis.—Both semesters. *One or two units.* Dean Benner and others.

164. Public School Finance.—Once a week; two hours; second semester. *One unit.* Associate Professor Weber.

170. Public School Business Administration.—Once a week; two hours; second semester. *One unit.* Associate Professor Weber.

184. Seminar in School Administration.—Once a week; two hours; second semester. *One unit.* Associate Professor Weber.

185. Seminar in Educational Psychology.—Once a week; two hours; both semesters. *One unit.* Professor Cameron, Associate Professor Griffith.

187. Seminar in Industrial Education and Guidance.—Once a week; two hours; first semester. *One unit.* Professor Mays.

190. Seminar in Educational Research.—Once a week; two hours; second semester. *One unit.* Dean Benner and others.

Courses for Graduates and Advanced Undergraduates

11. Ancient and Medieval Education.—Twice a week; first semester. Professor Seybolt.

18. Educational Measurements.—Three times a week; both semesters. Associate Professor Odell.

21. Supervision of Elementary Education.—Three times a week; first semester. Dr. Browne.

30. History of American Education.—Twice a week; second semester. Professor Seybolt.

40. Trends in Elementary Education.—Three times a week; first semester. Assistant Professor Dolch.

41. Vocational Education.—Three times a week; first semester. Professor Mays.

42. Special Education.—Twice a week; first semester. Assistant Professor Dolch.

43. Mental Tests.—Three times a week; second semester. Associate Professor Griffith.

44. Laboratory Problems in Learning.—Three times a week; second semester. Associate Professor Griffith.

45. Genetic Psychology for Teachers.—Three times a week; both semesters. Associate Professor Griffith.

50. Psychology of the Pre-School Child.—Three times a week; first semester. Associate Professor Griffith.

52. Function, Organization, and Methods of the Evening School.—Twice a week; second semester. Professor Mays.

53. Problems of Industrial Education.—Three times a week; both semesters. Professor Mays.

54. Functions and Methods of the Part-time School.—Twice a week; first semester. Professor Mays.

55. Vocational Guidance.—Three times a week; second semester. Professor Mays.

ELECTRICAL ENGINEERING

The prerequisite for graduate work in electrical engineering is the equivalent of the undergraduate courses required for the degree of Bachelor of Science in electrical engineering in the branches of the subject in which registration is desired.

Graduate students who wish to take a minor in electrical engineering must have had differential and integral calculus, and one year's work in college physics.

Courses offered to junior and senior students in electrical engineering are open for minor credit to students majoring in other departments who have the proper prerequisites.

Courses for Graduates

101. Advanced Courses in Alternating Currents.[2]—Both semesters. *One-half to two units:*
   (a) Graduate Seminar.—Professor Paine.
   (b) Circuit Transients.—Associate Professor Knight.
   (c) Machine Transients.—Assistant Professor Keener.
   (d) Symmetrical Components.—Assistant Professor Kraehenbuehl.

102. Electric Waves, Oscillations, and Transients.—Both semesters. *One-half to two units:*
(a) Theory of Electric Waves, Oscillations, and Transients.—Assistant Professor Reich.
(b) Demonstration Lectures.—Assistant Professor Reich.
(c) Theory of Energy Radiation.—Assistant Professor Brown.
(d) Principles of Television Engineering.—Assistant Professor Brown.

103. Electrical Design.—Both semesters. *One unit:*
(a) Power Plant Design.—Professor Paine.
(b) Machine Design.—Professor Paine.
(c) Illumination Practice and Design.—Assistant Professor Kraehenbuehl.

104. Vacuum Tubes and Electronic Control.—Both semesters. *One unit:*
(a) Theoretical Electronics.—Assistant Professor Reich.
(b) Vacuum Tubes and Amplifiers.—Assistant Professor Reich.
(c) Photoelectric Cells, Gaseous Control Tubes, and Inverters.—Assistant Professor Reich.

105. Electrical Engineering Research.—Both semesters. *One to three units.* Professors Paine, Tykociner; Associate Professor Knight; Assistant Professors Brown, Reich, Keener, Kraehenbuehl.

ENGLISH LANGUAGE AND LITERATURE

Students who enter on graduate work with English as their major subject are required to give evidence of their ability to write good English. They must present the equivalent of fourteen hours of undergraduate work in English literature, the required college work in rhetoric, and the equivalent of four semesters of college work in Latin, or in Greek, or in French, or in German. After the first year of graduate work a knowledge of French and German is indispensable.

Students making English their minor may be admitted to such courses as in the judgment of the instructor in charge they are qualified to pursue.

The Degree of Master of Arts in English.—In addition to complying with the general rules of the Graduate School, candidates for the degree of Master of Arts in English must comply with the following rules of the Department of English: (1) They must choose a portion of their work from the group of courses described as "for graduates"; (2) must offer an elementary course in Anglo-Saxon; and (3) must take besides the regular semester examinations in all their courses, a general examination, oral or written as the department may prescribe, which shall be a final test of the candidate's fitness and ability.

The Degree of Master of Arts in Speech.—Candidates for the degree of Master of Arts in Speech must comply with the following regulations: (1) They must satisfy the general requirements of the Department of English for admission to graduate work; (2) must offer a minor in English of not less than two units selected from the 100 courses in English literature; (3) must take, besides the regular examinations in all their courses, a general examination, oral or written as the department may prescribe, which shall be a final test of the candidate's fitness and ability.

The Degree of Doctor of Philosophy in English.—Candidates for the degree of Doctor of Philosophy in English may expect to be examined on the entire field of the English language and literature. They are urged, further-

more, to acquaint themselves as fully as possible with the history and philosophy of the period in which their main interest lies, and with the foreign languages and literature most closely related to English and that period.

Courses for Graduates

101. Research in Special Topics. — *One to two units.* Professors Graham, Bernbaum, Flom, Paul, Zeitlin, E. C. Baldwin, T. W. Baldwin, Jones, Hillebrand, Jefferson; Associate Professors Parry, Fletcher; Assistant Professors Rinaker, Secord, Finney.

111. Caedmon and Cynewulf.—Twice a week; first semester. *One unit.* Professor Jones.

114. The Development of the Essay.—The English essay; classical origins; continental influences. Twice a week; both semesters. *One unit.* Professor Zeitlin.

129. English Literature from the Norman Conquest to 1400.—Twice a week; both semesters. *One unit.* Professor Jones.

130. Tragedy.—Twice a week; both semesters. *One unit.* (Not given in 1934-35.) Professor Hillebrand.

135. Problems in American Literature.—Twice a week; both semesters. *One unit.* Professor Paul.

137. Prose Writers of the Nineteenth Century.—Twice a week; both semesters. *One unit.* (Not given in 1934-35.) Professor Zeitlin.

138. The Romantic Movement.—Twice a week; both semesters. *One unit.* (To receive credit, a student must take both semesters.) Professor Bernbaum.

140. Investigations in Modern English Literature.—(For second-year and third-year graduate students who are preparing theses for the doctor's degree.) Once a week; three hours; both semesters. *One to three units.* (May be taken in successive years.) Professor Bernbaum.

141. Literature of the Seventeenth Century.—Twice a week; both semesters. *One unit.* Professor E. C. Baldwin.

143. History and Theory of Prose Fiction.—Once a week; two hours; both semesters. *One unit.* (To receive credit, a student must take both semesters.) Professor Bernbaum.

145. Studies in Eighteenth Century Literature.—Twice a week; both semesters. *One unit.* Professor Graham.

147. Shakespeare and Elizabethan Drama.—Critical study of the chief plays. Twice a week; both semesters. *One unit.* Professor T. W. Baldwin.

148. Seminar in Elizabethan Drama.—Twice a week; second semester. *One unit.* Professor T. W. Baldwin.

153. Seminar in Restoration Drama.—Twice a week; second semester. *One unit.* Professor Hillebrand.

Courses for Graduates and Advanced Undergraduates

8. Old English (Anglo-Saxon).—Three times a week; first semester. Professor Flom.

9. Beowulf.—Three times a week; second semester. Professor Jones.

17. History of the English Language.—Three times a week; second semester. Professor Flom.

25. Chaucer.—Three times a week; first semester. Professor Jones.

26. Spenser.—Three times a week; second semester. Professor Jones.

29. English Literature from 1557 to 1688 (Exclusive of the Drama).—Three times a week; first semester. Professor E. C. Baldwin.

31. English Literature from 1688 to 1789 (Exclusive of the Drama).—Three times a week; second semester. Assistant Professor Secord.

33. English Literature from 1789 to 1837.—Three times a week; first semester. Professor Zeitlin.

34. Dr. Johnson and His Circle.—Three times a week; first semester. Assistant Professor Rinaker.

35. The English Drama (Previous to Shakespeare).—Three times a week; first semester. Professor T. W. Baldwin.

36. The English Drama (Exclusive of Shakespeare) from 1600 to 1700.—Three times a week; second semester. Professor Hillebrand.

38. The Arthurian Tradition.—Three times a week; second semester. Associate Professor Parry.

39. Introduction to Medieval Literature.—Three times a week; first semester. Associate Professor Parry.

50. Prose of the First Half of the Seventeenth Century.—Three times a week; second semester. (Not given in 1934-35.) Professor Zeitlin.

52. The Great Novelists of the Nineteenth Century.—Three times a week; first semester. Professor Bernbaum.

53. Modern American Criticism.—Three times a week; second semester. Professor Zeitlin.

54a–54b. Introduction to Comparative Literature.—Three times a week; both semesters. Professors Bernbaum, Aron, Carnahan, Oldfather, Van Horne; Associate Professors Parry, Hamilton; Assistant Professor Landis; Dr. Busey.

55a–55b. Survey of English Literature.—Three times a week; both semesters. Associate Professor Parry, Assistant Professor Finney.

57. Great Foreign Novelists in Relation to the English Novel.—Goethe, Hugo, Manzoni, Balzac, Dumas, Flaubert, Zola, Turgenev, Dostoevski, Tolstoi. Three times a week; first semester. (Not given in 1934-35.) Professor Bernbaum.

SCANDINAVIAN LANGUAGES

Preparation for major graduate work in the Scandinavian languages or literature must include a good knowledge of one of the Scandinavian languages and systematic work in the undergraduate courses in Scandinavian. Any graduate student in language may, however, be admitted to the purely philological courses.

Courses for Graduates

101. Old Norse.—Introduction to the language; grammar; reading of the Prose Edda in part, and selections from the sagas. Twice a week; both semesters. *One unit.* Professor Flom.

110. Advanced Old Norse (Old Norse Poetry).—Critical study of the Poetic Edda. Twice a week; second semester. *One unit.* (Not given in 1934-35.) Professor Flom.

130. The Runic Inscriptions (Introduction to Primitive Germanic).—Twice a week; first semester. *One unit.* Professor Flom.

150. Research.—Special problems in Scandinavian philology or literature. Thesis. Once a week; both semesters. *One-half to two units.* Professor Flom.

ENTOMOLOGY

The prerequisite for graduate work in entomology is two years of undergraduate biology, including zoology and entomology. Entrance on major work in entomology requires at least six hours of entomology. A reading knowledge of French and German is desirable by the beginning of the second year.

Courses for Graduates

100. Research.—Once or twice a week; both semesters. *One-half to four units.*
   (a) Morphology and Embryology of Insects. Associate Professor Hayes.
   (b) Economic Entomology. Professor Metcalf.
   (c) Systematic Entomology. Professor Metcalf, Assistant Professor Balduf.
   (d) Biology and Ecology of Insects. Professor Metcalf.

107. Insect Anatomy.—Lectures and laboratory. Three times a week; both semesters. *One unit.* (Given 1934-35 and in alternate years.) Associate Professor Hayes.

Courses for Graduates and Advanced Undergraduates

6. Special Problems.—Once or twice a week; both semesters. Various instructors.

8c. Pests of Man and Domestic Animals.—Lectures and laboratory. Three times a week; second semester. (Given in alternate years; not given in 1934-35.) Professor Metcalf.

10. Morphology and Taxonomy of Immature Insects.—Lectures and laboratory. Three times a week; both semesters. (Given in alternate years; not given in 1934-35.) Associate Professor Hayes.

20. Insect Control.—Lectures and laboratory. Three times a week; first semester. Professor Metcalf.

21. Insect Bionomics.—Lectures and readings. Three times a week; second semester. Professor Metcalf.

GENETICS

Those desiring a general training in genetics may take a major or minor in botany or zoology. Those desiring to approach agricultural problems through genetics may take a major or minor in agronomy, horticulture, or animal husbandry. For courses in the subject see departments of Agronomy, Animal Husbandry, Botany, Horticulture, and Zoology.

GEOLOGY AND GEOGRAPHY

For graduate work in geology the student must have had at least a major in geology and an acceptable field training. Other graduate students with adequate technical preparation may be admitted to certain graduate courses.

For graduate work in geography the student must have had at least the equivalent of a major in geography.

A. GEOLOGY

Courses for Graduates

102. Petrography.—Lectures; laboratory. Twice a week; both semesters. *One unit.* Professor Quirke.

122. Mountain and Continental Structures.—A study of the structure and dynamics of mountain ranges and of other areas having interesting structural problems. Three times a week; second semester. *One unit.* (Given in 1934-35 and in alternate years.) Assistant Professor Shepard.

125. Sedimentation.—The interpretation of sedimentary rocks in terms of their origin. Twice a week; first semester. *One unit.* (Given in 1934-35 and in alternate years.) Assistant Professor Wanless.

134. Advanced Studies in Geology.—Studies in petrography, crystallography, metamorphism, pre-Cambrian geology, ore deposition, advanced paleontology, micropaleontology, geophysical prospecting, and other subjects, to be arranged with members of the department. *One-half to four units.*

135. Research.—Once a week; both semesters. *One-half to four units.* Professors DeWolf, Savage, Quirke, Blanchard; Associate Professor Howard; Assistant Professors Page, Sutton, Wanless.

142. Paleozoic Stratigraphic Paleontology.—The invertebrate index fossils of the successive geologic formations. Twice a week; both semesters. *One unit.* (Given in 1934-35 and in alternate years.) Assistant Professor Sutton.

143. Post-Paleozoic Stratigraphic Paleontology.—Stratigraphic study of post-Paleozoic formations with a consideration of characteristic fossils. Twice a week; both semesters. *One unit.* (Given in alternate years; not given in 1934-35.) Assistant Professor Sutton.

151. Advanced Dynamic Geology.—A critical analysis of geologic processes and their results; the materials and structure of the earth; problems of geologic interpretations. Three times a week; first semester. *One unit.* (Given in 1934-35 and in alternate years.) Assistant Professor Shepard.

152. Advanced Historical Geology.—Cosmogeny; the record of diastrophism; the development of the continents and oceans; the relationship between oceanic fluctuations and organic differentiation and evolution; physiographic, climatic, and organic history. Three times a week; second semester. *One unit.* (Not given in 1934-35.) Assistant Professor Sutton.

160. Petroleum Geology.—Twice a week; both semesters. *One unit.* (Given in 1934-35 and in alternate years.) Associate Professor Howard.

161. Applied Petroleum Geology.—Twice a week; first semester. *One unit.* (Given in alternate years; not given in 1934-35.) Associate Professor Howard.

163. Geologic Development of the Continents.—The paleography of continents other than North America, together with an outline of the geology of these continents as described in foreign geological literature. Three times a week; both semesters. *One unit.* (Not given in 1934-35.) Associate Professor Howard.

Courses for Graduates and Advanced Undergraduates

15. Structural Geology.—Rock deformation and its results. Three times a week; second semester. (Given in alternate years; not given in 1934-35.) Assistant Professor Shepard.

16. Stratigraphy.—Fossil faunas, with special reference to Paleozoic invertebrates. Three times a week; second semester. (Given in 1934-35 and in alternate years.) Assistant Professor Sutton.

24. Field Methods and Mapping.—Once a week and three or four one-day field trips and one longer field trip. (Given in alternate years; not given in 1934-35.) Assistant Professor Wanless.

38. Regional Geology of the United States.—The characteristics of individual geologic provinces. Three times a week; first semester. (Given in alternate years; not given in 1934-35.) Associate Professor Howard.

49. Microscopic Petrography.—Five times a week; second semester. Professor Quirke.

60a–60b. Introduction to Research.—Two or four times a week; both semesters. Members of the department.

95. Economic Geology.—The nature, occurrence, origin, and uses of coal, oil, building stones, and bedded deposits of economic importance. Three times a week; first semester. (Given in alternate years; not given in 1934-35.) Professor DeWolf.

96. Economic Geology.—The nature, occurrence, and origin of metalliferous deposits; theories of ore deposition. Three times a week; second semester. (Given in alternate years; not given in 1934-35.) Professor Quirke.

B. GEOGRAPHY

Courses for Graduates

134. Advanced Studies in Geography.—Studies in geographical subjects. *One-half to four units.* Professor Blanchard, Assistant Professor Page.

135. Research.—Once a week; both semesters. *One-half to four units.* Professor Blanchard, Assistant Professor Page.

Courses for Graduates and Advanced Undergraduates

8. Geography of Europe.—Three times a week; first semester. Professor Blanchard.

11. Geography of Asia.—Three times a week; second semester. Dr. Poggi.

14a. Climate of the Continents.—Three times a week; second semester. (Given in 1934-35 and in alternate years.) Assistant Professor Page.

53a–53b. Advanced Economic Geography.—Three times a week; both semesters. Professor Blanchard.

60a–60b. Introduction to Research.—Two or four times a week; both semesters. Members of the department.

GERMAN

Students desiring to take German as a major are required to have finished successfully a four-year course of undergraduate work in German, or its equivalent. They are also required to be familiar with the principal works of the writers of the classical and modern periods of German literature, to show a general knowledge of the history of German literature, and to be able to follow lectures in the German language.

Of collateral subjects, a reading knowledge of French is important and is required for advanced graduate work. Some acquaintance with Latin and with German history is highly desirable.

Courses for Graduates

101. Seminar in the German Novel.—Twice a week; both semesters. *One unit.* Professor Aron.

Note.—Course 101 is arranged in a three-year rotation:
Seminar in Goethe and Schiller, 1935-36.
Seminar in Modern German Drama, 1936-37.

102. Thesis.—Both semesters. *One-half to two units.* Professors Aron, Brooks; Associate Professor Williams; Assistant Professor Geissendoerfer.

103. Introduction to the Historical Study of the Germanic Languages.—History of German philology; comparative grammar of the old Germanic dialects. Twice a week; first semester. *One unit.* Associate Professor Williams.

105. Old High German.—Grammar and interpretation of the oldest literary documents. Twice a week; second semester. *One unit.* Associate Professor Williams.

110. Early German Drama.—German drama up to the Reformation. Twice a week; second semester. *One unit.* (Alternates with course 32. Not given in 1934-35.) Professor Brooks.

113. German Literature of the Fifteenth and Sixteenth Centuries.—Twice a week; first semester. *One unit.* Professor Brooks.

117. German Literature of the Seventeenth and Eighteenth Centuries.—Twice a week; both semesters. *One unit.* (Given in alternate years.) Professor Aron.

121. Walther von der Vogelweide.—Twice a week; second semester. *One unit.* (Alternates with course 121a. Not given in 1934-35.) Professor Williams.

121a. The Nibelungenlied.—Twice a week; second semester. *One unit.* (Alternates with course 121.) Associate Professor Williams.

Courses for Graduates and Advanced Undergraduates

19a–19b. Goethe's Faust.—The Faust legend and early Faust books and plays; the genesis of Goethe's *Faust;* reading of both parts. Twice a week; both semesters. Professor Brooks.

26a. German Literature up to 1800.—Three times a week; first semester. Professor Aron.

26b. German Literature since 1800.—Three times a week; second semester. Professor Aron.

31. Middle High German.—Twice a week; first semester. Associate Professor Williams.

32. History of German Civilization.—Three times a week; second semester. (Alternates with course 110.) Professor Brooks.

HISTORY

Graduate work in history requires two years of college work in this subject, or sixteen semester hours, which should ordinarily include introductory courses in European and American history. Linguistic preparation is important, especially in French and German. For medieval history some knowledge of Latin is essential and Spanish is useful for certain fields of American history.

Advanced courses in history at the University of Illinois are of three kinds: (1) Courses for information and guidance in general reading. (2) Instruction in methodology, historiography, and bibliography. A part of this work (in course 103) is required of all graduate students in history during their first year. (3) Seminary courses for the study of special fields with a view primarily to training in the methods of historical criticism and research.

Illinois Historical Survey.—Students of history have an opportunity to pursue research in western history in connection with the Illinois Historical Survey, which is an organization for the purpose of carrying on systematic studies in the history of Illinois.

Attention is also called to the fact that the University of Illinois has for some time coöperated with the Trustees of the State Historical Library in the gathering and editing of archive material. As a result of this relation instructors and graduate students in the department have contributed from time to time to the publications of the Library and have been given useful training in the study of manuscript as well as of printed material.

Higher Degrees in History.—The following statement regarding the specific requirements for higher degrees in history is subject to the general requirements of the Graduate School.

Master of Arts

In addition to meeting the usual tests in the specific courses taken, each candidate for this degree will ordinarily be required to pass a general written examination early in the year and toward the close of the second semester an examination, also written, in two of the following fields: ancient history; medieval history of continental Europe; modern history of continental Europe; English history; American history; Latin-American history. The candidates are expected to have a general knowledge of historical methods (see course 103). The department further requires a working knowledge of one important foreign language, ordinarily French or German.

Doctor of Philosophy

Major Requirements.—A candidate who selects history as his major subject may offer himself for examination in any four of the fields indicated below, stating also the particular field among these four in which he wishes to specialize and in which his thesis is to be written:

1. Ancient history. 2. Medieval history and institutions of continental Europe, to the close of the thirteenth century. 3. Continental Europe from 1300 to 1648. 4. Continental Europe and its dependencies since 1648 (except as included in 5 and 6). 5. The history of England and its dependencies (not including America before 1783). 6. The history of the United States. 7. The history of Latin America. This enumeration of fields is not to be regarded as excluding the possibility of accepting others as may be determined by the department in individual cases.

Minor Subjects.—A candidate for the doctorate in history may select as his first minor one of the divisions of the field of history listed above which is not offered as a part of his major. He should preferably, however, select his minors from subjects offered by other departments. The following list of suitable minors is intended to be suggestive rather than exhaustive or compulsory.

Political Science.—(Any two acceptable for a first minor; any one, for a second minor.) 1. International law and diplomacy. 2. Modern government. 3. Municipal government. 4. Constitutional and administrative law and jurisprudence. 5. Political theory.

Economics and Sociology.—(Any two acceptable for a first minor; any one, for a second minor.) 1. Economic history. 2. Economic theory. 3. Public and private finance. 4. Social reform. 5. Principles of sociology.

Philosophy and Education.—(Any two acceptable for a first minor; any one, for a second minor.) 1. History of ancient and medieval philosophy. 2. History of modern philosophy. 3. History of education.

Literature.—Some division of the history of literature which may be either comparative literature of a limited period or the literature of a particular country for a more extended period as may be agreed upon in each case.

Courses for Graduates

101. Seminar in American History.—Once a week; two hours; both semesters. *One unit.* Semester I: Introduction to research in American history. Professor Robertson. Semester II: Guidance in the investigation of selected topics. Professor Randall.

102. Seminar in English History.—A study of selected topics in the early modern period. Arrange hours; both semesters. *One unit.* Professor Dietz.

103. Historiography and Historical Method.—Required of all candidates for an advanced degree in history who do not present evidence of similar training elsewhere. Twice a week; first semester. *One unit.* Professor Randall.

104. Seminar in European History.—Once a week; two hours; both semesters. *One unit.* Professor Lybyer.

105. Research in Special Topics.—Guidance in writing theses for advanced degrees. *One to two units.* Professors Larson, Lybyer, Robertson, Pease, Jones, Randall, Dietz, Hansen; Associate Professors Swain, Rodkey; Assistant Professors Dunbar, Ronalds, Werner.

106. Seminar in the History of the Later Middle Ages.—Arrange hours; both semesters. *One unit.* Professor Larson.

122. History of the West.—An intensive study of the westward movement, 1760-1816. Twice a week; both semesters. *One unit.* Professor Pease.

126. Spain in Europe and America, 1750-1870.—Bibliography, historiography, and topical reports. Arrange hours; first semester. *One unit.* Professor Robertson.

127. Inter-American Relations.—Relations of the Latin-American nations with each other and with the United States. The Monroe Doctrine, intervention, etc. Arrange hours; second semester. *One unit.* Professor Robertson.

133. Studies in the History of Europe in the Nineteenth Century.—Once a week; two hours; both semesters. *One unit.* Associate Professor Rodkey.

138. History of France in the Sixteenth and Seventeenth Centuries.—Twice a week; both semesters. *One unit.* Professor Jones.

150. Seminar in Ancient History.—Problems in the relations of East and West. Arrange hours; both semesters. *One unit.* Associate Professor Swain.

Courses for Graduates and Advanced Undergraduates

16a–16b. The American Colonies in the Eighteenth Century and the Beginnings of National Life and Organization.—Three times a week; both semesters. Assistant Professor Dunbar.

17a–17b. Social and Economic Forces in the United States in the Nineteenth Century.—Three times a week; both semesters. (Not given in 1934-35.) Professor Hansen.

19a–19b. History of American Immigration.—Twice a week; both semesters. (Not given in 1934-35.) Professor Hansen.

20a–20b. History of the South.—Twice a week; both semesters. Professor Randall.

21. History of the United States since 1877.—Twice a week; first semester. Professor Robertson.

22a.–22b. History of the West, 1634-1830.—Twice a week; both semesters. Professor Pease.

25. The Civil War and the Reconstruction.—Three times a week; first semester. Professor Randall.

26. History of the Latin-American Colonies.—Three times a week; first semester. Professor Robertson.

27. History of Latin America from the Wars of Independence to the Present Time.—Three times a week; second semester. Professor Robertson.

29. America and Europe, 1776-1870.—Foundations of international intercourse, with particular reference to the Latin-American colonies and states. Three times a week; second semester. Professor Robertson.

32a–32b. History of Europe, since 1878.—Three times a week; both semesters. Professor Lybyer.

36a–36b. History of the German People in Medieval and Modern Times.—Three times a week; both semesters. Associate Professor Rodkey.

37a–37b. History of Eastern and Southern Asia.—Three times a week; both semesters. (Not given in 1934-35.) Professor Lybyer.

38a–38b. Development of the French Monarchy in the Later Middle Ages and in Early Modern Times, 1285-1648.—Three times a week; both semesters. Professor Jones.

39a–39b. The Renaissance and the Protestant and Catholic Reformations.—The transition from medieval to modern ideals. Three times a week; both semesters. (Not given in 1934-35.) Professor Jones.

44a–44b. Constitutional History of England.—Three times a week; both semesters. Professor Larson.

46a–46b. Social and Economic History of England, 1750-1934.—Three times a week; both semesters. Professor Dietz.

47a–47b. History of England in the Later Middle Ages and in the Early Modern Period, 1399-1603.—Three times a week; both semesters. (Not given in 1934-35.) Professor Dietz.

55. History of the Ancient Greek States.—Three times a week; first semester. Professor Oldfather.

56. History of the Roman Republic.—Three times a week; second semester. Professor Oldfather.

57a–57b. Ancient Imperialism, Hellenistic and Roman.—Three times a week; both semesters. Associate Professor Swain.

60. The United States in the World War.—Three times a week; second semester. Professor Randall.

62a–62b. Political and Constitutional Development of the United States.—Three times a week; both semesters. Professor Randall.

HOME ECONOMICS

As preparation for graduate work with a major in foods and nutrition the student must have had at least the equivalent of the foods and nutrition required in the undergraduate curriculum for the general major in home economics and, in addition, 3-5 hours in foods, dietetics, and nutrition; also quantitative chemical analysis.

As preparation for graduate work with a major in general home economics a student must have had the equivalent of the undergraduate curriculum for the general major in home economics, including a course in the principles of economics.

In addition to graduate courses in home economics the student will offer, for a major in foods and nutrition, either Chemistry 50a or 40 and 41, and for the general major, further courses in education, economics, or sociology.

Graduate students who choose home economics as a minor for the degree of Doctor of Philosophy must have had adequate preliminary preparation in foods and nutrition and must include among the courses to be taken for the minor either Home Economics 41 and 103 or 35 and 105, or must have had their equivalent. Of the courses open to advanced undergraduates, selection may be made from courses 20, 33, 35, 39a, 39b, and 41.

Courses for Graduates

101. Home Economics.—Twice a week; both semesters. *One unit.* Professor Wardall.

102. Research in Nutrition.—Both semesters. *One-half to three units.* Assistant Professor Outhouse.

103. Nutrition Seminar.—Once a week; both semesters. *One-half unit.* Assistant Professor Outhouse.

104. Research in Foods.—Both semesters. *One-half to three units.* Associate Professor Woodruff.

105. Foods Seminar.—Once a week; both semesters. *One-half unit.* Associate Professor Woodruff.

Courses for Graduates and Advanced Undergraduates

20. Physical Growth and Nutrition.—Twice a week; first semester. Assistant Professor Outhouse.

28. Organization and Management of the Household.—Twice a week; second semester. Assistant Professor Nickell.

31. Clothing.—Three times a week; second semester. Miss Whitlock.

33. Diet in Disease.—Three times a week; second semester. Assistant Professor Barto.

35. Problems in Foods.—Three times a week; both semesters. Associate Professor Woodruff.

39a–39b. Readings in Food and Nutrition.—Once a week; both semesters. Associate Professor Woodruff; Assistant Professors Outhouse, Barto.

41. Problems in Nutrition.—Three to five times a week; second semester. Assistant Professor Outhouse.

43a–43b. Problems in Textiles and Clothing.—Three times a week; both semesters. Assistant Professors Jacobsen, Weaver; Miss Whitlock, Miss Eades.

45. Nutrition Classes.—Twice a week; second semester. Assistant Professor Barto.

48. Institutional Dietaries and Administration.—Three times a week; second semester. Assistant Professor Smith.

50. Costume Design.—Three times a week; second semester. Miss Eades.

51. Textiles.—Twice a week; second semester. Assistant Professor Jacobsen.

55. Food and Nutrition.—Five times a week; first semester. Assistant Professor Outhouse.

56. Child Development.—Twice a week; second semester. Assistant Professor Walls.

57a–57b. Problems in Household Management.—Three times a week; both semesters. Assistant Professor Nickell.

HORTICULTURE

Graduate work is offered in the Department of Horticulture leading to the M.S. and Ph.D. degrees. Candidates may specialize for either degree in floriculture, olericulture, or pomology.

Twenty hours of collegiate work in horticulture and allied subjects are required for entrance upon major work, and twelve hours for minor work.

Courses for Graduates

103. Olericulture.—Once a week; both semesters. *One to two units.* Professor Lloyd.

105. Marketing Fruits and Vegetables.—See Agricultural Economics 135.

106. Olericulture Seminar.—Once a week; first semester. *One-fourth unit.* Professor Lloyd.

108. Pomology.—Three times a week; both semesters. *One to four units.*
(a) Pomological Problems.—Professor Blair.
(b) Pomology and Fruit Breeding.—Professor Dorsey.
(c) Pomological Physiology.—Professor Ruth; Assistant Professor Kelley.
(d) Small Fruits.—Professor Colby.
(e) Pomological Pathology.—Professor Anderson.

115. Floriculture.—Once a week; both semesters. *One to two units.*
(a) Floricultural Problems.—Professor Dorner.
(b) Floricultural Physiology and Pathology.—Associate Professor Weinard.

120. Pomology Seminar.—Once a week; both semesters. *One-fourth unit.* Professors Dorsey, Ruth, Anderson.

125. Fruit Development.—Three times a week; first semester. *One unit.* Professor Dorsey.

130. Physiology of Fruit Production.—Three times a week; first semester. *One unit.* Professor Ruth.

135. Fruit Disease Research.—Three times a week; first semester. *One unit.* Professor Anderson.

140. Advanced Small Fruit Culture.—Three times a week; second semester. *One unit.* Professor Colby.

Courses for Graduates and Advanced Undergraduates

43. Greenhouse Fertilizers.—Three times a week; first semester. Associate Professor Weinard.

44. Current Pomological Literature.—For seniors and graduates specializing in pomology. Once a week; both semesters. Professor Ruth.

45. Plant Nutrition.—Three times a week; second semester. Associate Professor Weinard.

46. Marketing Horticultural Products.—See Agricultural Economics 36.

47. Fruit Storage.—The effects of environment upon fruits. The storage of fruits. Three times a week; first semester. Professor Ruth.

51. Fruit Diseases.—Three times a week; second semester. Professor Anderson.

LIBRARY SCIENCE

Candidates for the master's degree in library science must have completed at least thirty semester hours' work in library science in this institution or in an approved institution.

Students desiring to prepare for work in special types of libraries will be expected to include at least one unit of advanced courses in appropriate subjects other than library science. All such changes in the program of the student must be approved by the Director of the Library School.

Courses for Graduates

101. Thesis.—*One to two units.* Professor Windsor and others.

102. Seminar.—Both semesters. *One to three units.*

(a) Techniques of the Study of Reading Interests.—(Not given in 1934-35.)

(b) College and University Library Administration.—Once a week; two hours; second semester. *One unit.* Professor Windsor.

(c) Publishers.—Once a week; two hours; first semester. *One unit.* Assistant Professor Boyd.

(d) Special Libraries.—

103. Advanced Reference.—Twice a week; both semesters. *One-half unit.* Miss Phelps.

104. Advanced Cataloging and Classification.—Once a week; two hours; both semesters. *One-half unit.* Assistant Professor Bond.

Courses for Graduates and Advanced Undergraduates

7. History of Libraries.—Twice a week; second semester.

9. History of Books and Printing.—Twice a week; second semester. (Not given in 1934-35.)

13a. U. S. Government Publications.—Twice a week; first semester. Miss Phelps.

24a–24b. Book Selection for Special Groups.—Twice a week; both semesters. Miss Hostetter.

42. State and Foreign Government Publications.—Three times a week; second semester. Miss Phelps.

44. Bookbuying for the Large Library.—Twice a week; first semester. (Given in 1934-35 and in alternate years.) Miss Garver.

45. Library Buildings and Equipment. — Twice a week; second semester. Miss Gramesly.

46. High School Library Administration.—Three times a week; second semester. Miss Hostetter.

48. Public Library Administration. — Three times a week; first semester. Miss Gramesly.

49. Children's Literature.—Twice a week; second semester. Miss Hostetter.

MATHEMATICS

Students entering on graduate study with a major in mathematics must have had twenty hours of undergraduate work in mathematics besides the usual freshman courses in algebra, trigonometry, and analytic geometry, including a one-year course in calculus and one year of more advanced work in one or more of the fields of algebra, analysis, and geometry. They should be able to read German or French.

Candidates for a doctor's degree taking a first minor in mathematics are expected to have completed a course in calculus and are required to take two one-year courses beyond the calculus; candidates for a doctor's degree taking a second minor are required to complete at least one course throughout a year beyond the calculus.

The more technical courses offered by the department are arranged mainly in cycles of two or of three years, so that a properly qualified student will usually have opportunity to take any particular course at some time during the three years of residence required for the doctor's degree.

Courses for Graduates

100. Seminar.—For thesis work, or for special reading with the consent of the instructor. Three times a week; both semesters. *One to two units.* Professors Carmichael, Emch, Coble; Associate Professors Crathorne, Hazlett, Lytle; Assistant Professors Levy, Brahana. For the master's degree: Assistant Professor Bailey; Dr. Steimley, Dr. Ketchum, Dr. Bourgin, Dr. Pepper.

101. Functions of Real Variables.—Three times a week; both semesters. *One unit.* (Not given in 1934-35.) Professor Carmichael.

110. Elliptic Functions.—Three times a week; both semesters. *One unit.* (Not given in 1934-35.) Professor Carmichael.

112. Linear Difference Equations.—Three times a week; both semesters. *One unit.* Professor Carmichael.

113. Linear Differential Equations.—Three times a week; both semesters. *One unit.* (Not given in 1934-35.) Professor Carmichael.

124. The Theory of Numbers.—First semester: Theory of congruences and residues. Second semester: Theory of algebraic numbers. Three times a week; both semesters. *One unit.* (Not given in 1934-35.) Associate Professor Hazlett.

126. Theory of Groups.—Introductory course. Three times a week; second semester. *One unit.* (Not given in 1934-35.)

129. Theory of Statistics.—The mathematical theory underlying statistics with applications to problems in economics, biology, and sociology. Three times a week; both semesters. *One unit.* Associate Professor Crathorne.

131. Algebraic Geometry.—Three times a week; both semesters. *One unit.* Professor Emch.

135. Differential Geometry.—Three times a week; both semesters. *One unit.* (Not given in 1934-35.) Assistant Professor Levy.

139. Analysis Situs.—Three times a week; both semesters. *One unit.* (Not given in 1934-35.) Assistant Professor Brahana.

141. Vector Methods.—Three times a week; both semesters. *One unit.* (Not given in 1934-35.) Dr. Ketchum.

143. Linear Algebras.—Three times a week; both semesters. *One unit.* Associate Professor Hazlett.

170. Algebra.—Three times a week; both semesters. *One unit.* Assistant Professor Brahana.

171. Analysis.—Three times a week; both semesters. *One unit.* Dr. Pepper.

172. Geometry.—Three times a week; both semesters. *One unit.* Professor Coble.

Courses for Graduates and Advanced Undergraduates

16–17. Differential Equations and Advanced Calculus.—Three times a week; both semesters. Assistant Professor Bailey, Dr. Steimley.

21. Theory of Probability.—Three times a week; second semester. Associate Professor Crathorne.

22. Statistics.—May be counted only toward a minor in mathematics. Three times a week; first semester. Associate Professor Crathorne.

30–31. Actuarial Theory.—Three times a week; both semesters. (Not given in 1934-35.) Associate Professor Crathorne.

32. History of Mathematics.—Three times a week; second semester. Associate Professor Lytle.

35. Teachers' Course.—May be counted only toward a minor in mathematics. Three times a week; both semesters. Associate Professor Lytle.

36. Advanced Aspects of Euclidean Geometry.—Three times a week; first semester. Associate Professor Lytle.

40. Fundamental Concepts of Mathematics.—Three times a week; second semester. (Not given in 1934-35.) Associate Professor Lytle.

52. Differential Equations of Mathematical Physics.—Three times a week; both semesters. (Not given in 1934-35.) Dr. Bourgin.

53. Integral and Operational Equations in Mathematical Physics.—Three times a week; both semesters. Dr. Bourgin.

60. Introduction to the Theory of Numbers.—Three times a week; second semester. (Not given in 1934-35.) Dr. Pepper.

70. Introduction to Higher Algebra.—Three times a week; both semesters. Professor Coble.

71. Introduction to Higher Analysis.—Three times a week; both semesters. Dr. Ketchum.

72. Introduction to Higher Geometry.—Three times a week; both semesters. Assistant Professor Levy.

MECHANICAL ENGINEERING

The prerequisite for graduate work in mechanical engineering is the equivalent of the undergraduate course required for the degree of Bachelor of Science in mechanical engineering in the branches of the subject in which registration is desired. Courses offered to junior and senior students are open for minor credit to students majoring in other departments.

Courses for Graduates

107. THERMODYNAMICS.—Twice a week; both semesters. *One unit.* Associate Professor GOFF.

108. THE FLOW OF FLUIDS AND HEAT TRANSFER.—Twice a week; both semesters. *One unit.* Professor MACINTIRE.

109. MECHANICAL ENGINEERING DESIGN.—(A) Machine Design. (B) Power Plant Design. (C) Dynamics of Machinery. Arrange; both semesters. *One unit.* Professors LEUTWILER, HAM.

112. LABORATORY INVESTIGATIONS.—Three times a week; both semesters. *One and one-half units.* Professors KRATZ, POLSON, HAM, MACINTIRE; Associate Professor GOFF.

MINING ENGINEERING

The prerequisite for graduate work in mining engineering is the equivalent of the undergraduate courses required for the degree of Bachelor of Science in mining in the branches of the subject in which registration is desired.

Courses for Graduates

101. ADVANCED MINING PRACTICE.—Twice a week; either semester. *One unit.* Professor CALLEN.

102. ADVANCED PREPARATION OF COAL AND ORES.—Twice a week; either semester. *One unit.* Assistant Professor MITCHELL.

104.[1] MINING REPORTS.—Twice a week; either semester. *One unit.* Professor CALLEN.

105.[1] WELFARE WORK AND EDUCATION AMONG MINE EMPLOYEES.—Twice a week; either semester. *One unit.* Professor CALLEN.

106.[1] ADVANCED COAL, ORE, AND METALLURGICAL PLANT DESIGN.—Twice a week; second semester. *One unit.* Assistant Professor MITCHELL.

107.[1] ADVANCED NON-FERROUS METALLURGICAL PROJECTS.—Twice a week; either semester. *One unit.* Assistant Professor MITCHELL.

Courses for Graduates and Advanced Undergraduates

6. MECHANICAL ENGINEERING OF MINES.—Three times a week; first semester. Professor CALLEN.

8. MINE ADMINISTRATION.—Three times a week; first semester. Mr. NICHOLSON.

9. PREPARATION OF COAL AND ORES.—Three times a week; first semester. Assistant Professor MITCHELL.

15. MINE VENTILATION.—Twice a week; second semester. Professor CALLEN.

[1]Of courses 104 and 105 only one will be given either semester, according to election of students; the same applies to courses 106 and 107.

20. Mine Ventilation Laboratory.—Twice a week; second semester. Professor Callen.

21. Mine Examination and Valuation.—Three times a week; second semester. Mr. Nicholson.

41. Principles of Mining and Metallurgical Design.—Three times a week; first semester. Assistant Professor Mitchell.

42. Mining and Metallurgical Design.—Twice a week; second semester. Assistant Professor Mitchell.

64. Mining Laboratory.—Twice a week; second semester. Assistant Professor Mitchell.

PHILOSOPHY

Students who enter on graduate work with philosophy as their major subject must have had a general course in the history of philosophy, a course in logic, and a general course in psychology.

Courses for Graduates

103. Ethics.—Twice a week; first semester. *One unit.* Professor Morrow.

105. Seventeenth Century Continental Thought.—Twice a week; first semester. *One unit.* Assistant Professor Gotshalk.

106. English and American Idealism.—Twice a week; second semester. *One unit.* Professor Morrow.

108. Plato.—Twice a week; first semester. *One unit.* Professor Tawney.

110. Locke, Berkeley, Hume.—Twice a week; second semester. *One unit.* Assistant Professor Gotshalk.

118. Medieval Philosophy.—Twice a week; second semester. *One unit.* Professor Tawney.

119. Seminar in Ancient Philosophy.—Twice a week; first semester. *One unit.* Professor McClure.

120. Seminar in Modern Philosophy.—Twice a week; second semester. *One unit.* Professor McClure.

Courses for Advanced Undergraduates and Graduates

3. History of Ancient and Medieval Philosophy.—Three times a week; first semester. Assistant Professor Nicholson.

4. History of Modern Philosophy.—Three times a week; second semester. Assistant Professor Gotshalk.

7. Ethics.—Three times a week; first semester. Professor Morrow.

8. Philosophy of the Recent Past.—Three times a week; first semester. Assistant Professor Nicholson.

9. Political and Social Ethics.—Three times a week; second semester. Professor Morrow.

10. Philosophy of Science.—Three times a week; first semester. Assistant Professor Gotshalk.

11a. Philosophy of Religion (Systematic).—Three times a week; first semester. Professor Tawney.

11b. Philosophy of Religion (Historical).—Three times a week; second semester. Professor Tawney.

12. Philosophy of Art.—Three times a week; first semester. Assistant Professor Gotshalk.

16. Metaphysics.—Three times a week; second semester. Assistant Professor Gotshalk.

22. American Philosophy (Royce, James, Santayana, and Dewey).—Three times a week; second semester. Dr. DeLargy.

PHYSICS

A year of calculus and a year of general physics, with laboratory, are prerequisite for all major and minor graduate work in physics. In addition, graduate students majoring in physics must have had one more advanced course in either physics or mathematics and should be able to use references in German.

Courses for Graduates

104a–104b. Electric and Magnetic Measurements.—Twice a week; three hours; both semesters. *One unit.* (Not given in 1934-35.) Professor Knipp, Associate Professor Williams.

122. Dynamics.—Three times a week; both semesters. *One unit.* Professor Kunz.

123. Dynamical Theory of Sound.—Three times a week; second semester. *One unit.* Professor Watson.

124. Conduction of Electricity through Gases.—Three times a week; second semester. *One unit.* Professor Knipp.

125. Hydrodynamics.—Especially modern problems in flow and turbulence. Three times a week; second semester. *One unit.* Professor Kunz.

126. Theory of Elasticity.—Three times a week; second semester. *One unit.* (Not given in 1934-35.) Professor Kunz.

127. Relativity.—Three times a week; both semesters. *One unit.* (Not given in 1934-35.) Dr. Mott-Smith.

128. Problems and Methods in Theoretical Physics.—Three times a week; first semester. *One unit.* (Not given in 1934-35.) Dr. Mott-Smith.

129. Mechanical Vibrations.—The general theory, with applications to plates, rotating shafts, gyroscopes, structures, etc. Twice a week; both semesters. *One-half unit.* (Not given in 1934-35.) Professor Kunz.

131a. Physical Laboratory Technique.—Especially glassblowing and discharges in gases. First semester. *One unit.* Professor Knipp.

131b. Physical Laboratory Technique.—Especially spectroscopic light sources and electronic phenomena. Second semester. *One unit.* Assistant Professor Kruger.

146. Electrodynamics.—Three times a week; both semesters. *One unit.* Assistant Professor Bartlett.

147. Electric Oscillations.—Twice a week; both semesters. *One-half unit.* (Not given in 1934-35.) Professor Kunz.

160. Thermodynamics.—Three times a week; first semester. *One unit.* Professor Kunz.

163. Statistical Mechanics.—Three times a week; second semester. *One unit.* (Not given in 1934-35.) Dr. Mott-Smith.

170. Light.—Largely physical optics and spectroscopy. Lectures, assigned readings and recitations, with laboratory experiments. Both semesters. *One to two units.* (Not given in 1934-35.) Dr. Almy.

184. Line Spectra and Atomic Structure.—Three times a week; first semester. *One unit.* Dr. Almy.

185. Band Spectra and Molecular Structure.—Three times a week; second semester. *One unit.* Dr. Almy.

186a–186b. Quantum Mechanics.—Three times a week; both semesters. *One unit.* Dr. Mott-Smith.

190. Research.—Both semesters. *One to three units.* Professors in the department.

198. Seminar.—Both semesters. *One to two units.* Professors in the department.

199. Physics Colloquium.—Attendance is expected of all graduate students. Once a week; both semesters. *No credit.* Dr. Mott-Smith.

Courses for Graduates and Advanced Undergraduates

14a–14b. Theoretical Mechanics.—Three times a week; both semesters. Dr. Mott-Smith.

15. Electricity and Magnetism.[1]—Recommended to students in non-technical courses who wish a knowledge of electricity and magnetism beyond the course in general physics. Two recitations or lectures and one three-hour laboratory exercise weekly; second semester. Associate Professor Williams.

17. Light.[1]—Recommended to students in non-technical courses. Two lectures and a three-hour laboratory period weekly; first semester. Associate Professor Schulz.

23. Sound.—Three times a week; first semester. Professor Watson.

25. Architectural Acoustics.—Twice a week; second semester. Professor Watson.

30. Introduction to Theoretical Electricity.—For advanced students in physics, chemistry, mathematics, and engineering. Three times a week; first semester. Associate Professor Williams.

44a–44b. Electric and Magnetic Measurements.—Two three-hour periods a week; both semesters. Professor Knipp; Associate Professor Williams.

46. Advanced Electrical Measurements.—Two three-hour laboratory periods weekly; second semester. (Not given in 1934-35.) Associate Professor Williams.

51. Practical Optics.—Two lectures and a three-hour laboratory period weekly; second semester. Associate Professor Schulz.

60. Heat.—Three times a week; first semester. Associate Professor Paton.

61. Heat Laboratory.—To accompany Physics 60. One three-hour period a week; first semester. Associate Professor Paton.

62. Kinetic Theory of Heat and Radiation.—Three times a week; second semester. Associate Professor Paton.

71a–71b. Light.—For advanced students in physics, chemistry, mathematics or engineering. Twice a week; both semesters. (Not given in 1934-35.) Dr. Almy.

72a–72b. Light Laboratory.—To accompany Physics 71a-71b. Twice a week; both semesters. (Not given in 1934-35.) Dr. Almy.

78. X-rays.—Three times a week; second semester. (Not given in 1934-35.)

[1]This course may not be taken for major credit.

80. Atomic Physics.—A lecture and problem course presenting our modern knowledge of the nature and properties of atoms, ions, electrons, protons, positrons, light quanta, photoelectricity, thermoelectric emission, x-rays, radioactivity, and cosmic rays. Three times a week; first semester. Professor Loomis.

PHYSIOLOGY

The prerequisites for graduate work in physiology are Physiology 1 or 4, 6, 7, and 9, or equivalents.

Courses for Graduates

101. Journal Club.—Review of literature. Both semesters. *One-fourth unit.* Associate Professor Burge.

102. Research.—Both semesters. *One to two units.* Associate Professor Burge.

103. Special Phases of the Physiology of Respiration, Circulation, Digestion, Metabolism, Excretion, Secretion, Glands of Internal Secretion, Nervous System.—Both semesters. *One-half to one unit.* Associate Professor Burge, Dr. Steggerda.

Course for Graduates and Advanced Undergraduates

6–7. Advanced Mammalian Physiology.—Five times a week; both semesters. Dr. Steggerda.

POLITICAL SCIENCE

Graduate work in political science is conducted in the following special fields: (1) political theory; (2) international law and diplomacy; (3) modern government; (4) constitutional law, administrative law, and jurisprudence; (5) municipal administration.

To be admitted to take political science as a major subject, the student must have done at least 18 hours of undergraduate work in political science, economics, and history, not less than nine hours of which have been in political science. To take political science as a minor he must have had at least nine hours' work in these fields, including six hours in political science.

If a student making political science his major is taking both of his minors in other departments, one of them must be in history, economics, or sociology.

Several courses given in other departments are so closely related to those in political science that graduate students whose major is political science may be permitted on petition to take such courses as part of their major work. Attention is called to the courses in public law in the College of Law, the courses in city planning given by the College of Fine and Applied Arts, and the technical courses in municipal and sanitary engineering in the College of Engineering.

Courses for Graduates

101. History of Political Theories.—Three times a week; first semester. *One unit.* Professor Garner.

102. The Nature of the State.—Twice a week; second semester. *One unit.* Professor Fairlie.

103. Seminar in Political Science and Public Law.—Once a week; both semesters. Members of the department.

104. Municipal Administration.—Twice a week; second semester. *One unit.* Professor Fairlie.

105. Constitutional Law: Research in Selected Topics.—Twice a week; first semester. *One unit.* Professor Mathews.

106a–106b. Special Topics in International Law.—Research course. Twice a week; both semesters. *One unit.* Professor Garner.

107. Foreign Relations of the United States.—Twice a week; first semester. *One unit.* (Not given in 1934-35.) Professor Mathews.

108. Problems of International Organization.—Special problems in the field of international organization, with special attention to the League of Nations. Twice a week; first semester. *One unit.* Professor Berdahl.

112. Studies in Public Administration.—Special topics in national, state, or local administration in the United States. Twice a week; first semester. *One unit.* Professor Fairlie.

113. State Government: Research in Selected Topics.—First semester. *One unit.* Professor Mathews.

114. Studies in Political Parties.—Twice a week; second semester. *One unit.* Professor Berdahl.

121. Problems in British Administration.—Twice a week; time to be arranged. *One unit.* Professor Fairlie.

Courses for Graduates and Advanced Undergraduates

4. Municipal Government.—Three times a week; first semester. Dr. Hill.

5. The American Constitutional System.—Three times a week; first semester. Professor Mathews.

6a. International Law.—Three times a week; first semester. Professor Garner.

6b. International Law.—(Continuation of 6a.) Three times a week; second semester. Professor Garner.

7. American Foreign Relations.—Three times a week; second semester. Professor Mathews.

8. International Organization.—Twice a week; first semester. Professor Berdahl.

9. Principles of Jurisprudence.—Three times a week; second semester. Professor Fairlie.

11. The Constitution and Industrial Legislation.—Three times a week; second semester. Assistant Professor Hyneman.

12. Public Administration.—Three times a week; first semester. Professor Fairlie.

13. Government Regulation of Business.—Three times a week; first semester. Assistant Professor Hyneman.

14a. Political Parties: Party History and Issues.—Three times a week; second semester. (Alternates with Political Science 14b.) Professor Berdahl.

14b. Political Parties: Party Organization and Methods.—Three times a week; first semester. (Not given in 1934-35; alternates with Political Science 14a.) Professor Berdahl.

18. Legislation in the United States.—Three times a week; second semester. (Not given in 1934-35.)

21. British Government.—Twice a week; first semester. Professor Fairlie.

22. Continental European Governments.—The constitutions and political systems of the principal countries of continental Europe. Three times a week; second semester. Professor Garner.

28. Current Governmental Problems.—Twice a week; second semester. (Not given in 1934-35.) Professor Mathews.

32. Principles of Political Science.—Twice a week; second semester. Professor Fairlie.

34. Municipal Problems.—Municipal administration in the United States and Europe. Three times a week; second semester. Dr. Hill.

PSYCHOLOGY

Graduate students who elect psychology as their major subject must have had standard courses, of university grade, both in general psychology and in the psychological laboratory. One general university course is the minimal requirement for graduate students who apply to the department for a minor subject.

Courses for Graduates

102. Translation of Psychological Treatises.—Critical reading of French and German books and articles. Both semesters. *One-half unit.* Professor Woodrow.

103. Research.—Experimental investigations. Both semesters. *One-half to two units.* Professor Woodrow; Associate Professors Culler, Young; Assistant Professor Higginson.

105. Seminar. — Discussion of current topics in their historical setting, with especial emphasis upon research problems. Both semesters. *One unit.* Professor Woodrow.

106. Neural Theory of the Psychological Functions.—Second semester. *One unit.* Associate Professor Culler.

108. Quantitative Methods. — The logic of research methods in psychology. Second semester. *One unit.* Associate Professor Culler.

Courses for Graduates and Advanced Undergraduates

5. Comparative Psychology.—A systematic survey of animal behavior with particular reference to the behavior of the vertebrates. Laboratory and discussion. Three times a week; first semester. Dr. McAllister.

8. Feeling and Emotion. — A critical analysis of the facts, problems, and methods of affective psychology, with special reference to recent physiological studies. Twice a week; second semester. Associate Professor Young.

9. Physiological Psychology.—The physiological basis of conscious experience. Twice a week; first semester. Associate Professor Culler.

10. Mental and Physical Work (Industrial Psychology).—The psychology of work and the factors affecting it, with special reference to work in industry. Twice a week; second semester. Dr. Ruch.

11. Learning and Comprehension. — Processes and functions in acquiring knowledge and skill. Twice a week; first semester. Associate Professor Culler.

12–13. Minor Problems (Advanced Laboratory).—Application of methods suitable to new problems in general and comparative psychology. Three times a week; both semesters. Professor Woodrow; Associate Professor Culler, Dr. McAllister.

14. Social Psychology.—Psychological factors in the control of group behavior and the adjustment of the individual to social situations. Three times a week; second semester. Dr. McAllister.

16. Genetic Psychology.—The psychological development of the individual with special reference to childhood. Twice a week; first semester. Dr. Ruch.

17. The History of Psychology.—Three times a week; second semester. Associate Professor Young.

18. Perception.—Perceptual experience; recent revisions of perceptual theory including the doctrine of the *Gestalt*. Lectures and discussions. Twice a week; second semester. Associate Professor Culler.

20. Systematic Psychology.—A critical study of contemporary systems: behaviorism, *Gestalt psychologie,* structural, functional and dynamic psychology. For seniors and graduates. Twice a week; second semester. Professor Woodrow.

21. Character and Personality.—An analysis of the non-intellectual aspects and determinants of mentality and conduct, with special applications to behavior problems and personnel psychology. Three times a week; first semester. Dr. Sears.

23. Abnormal Psychology. — Analytical consideration of types of behavior deviating from the normal. Three times a week; second semester. Dr. Sears.

26. Recent Experimental Problems.—Recent experimental methods and results. Twice a week; first semester. Dr. McAllister.

28. The Psychology of Motivation.—Instinct, drive, desire, habit, and attitude as determinants of behavior; mental conflicts and types of adjustment. Twice a week; first semester. Associate Professor Young.

34. Individual Differences.—A study of the variation in the mental characteristics of individuals and of groups. Three times a week; first semester. Professor Woodrow.

RAILWAY ENGINEERING

The prerequisite for graduate work in railway engineering is the equivalent of the undergraduate courses required for the degree of Bachelor of Science in railway engineering in the branch of the subject in which registration is desired.

Certain courses offered senior students are open to graduates for minor credit. Courses 5 and 8 (Railway Laboratory) may be taken among major subjects.

Courses for Graduates

102. Locomotive Design.—Once a week; either semester. *One unit.* Professor Young.

106. Locomotive Operation.—Once a week; either semester. *One unit.* Professor Schmidt.

110. Railway Location.—Twice a week; either semester. *One unit.* Professor King.

ROMANCE LANGUAGES AND LITERATURE

A student entering on graduate work for an advanced degree must have had at least three years of college work in his major subject, including one advanced literary course.

Students who enter with a knowledge of Latin and of a second Romance language, together with a reading knowledge of German, will find their work for an advanced degree greatly facilitated.

FRENCH

Courses for Graduates

101. Old French Literature.—Twice a week; both semesters. *One unit.* Professor Oliver.

102. Villon, Rabelais, Montaigne, La Pléiade.—Twice a week; both semesters. *One unit.* Assistant Professor Will.

103. Seventeenth Century Literature.—Twice a week; both semesters. *One unit.* (Not given in 1934-35.) Professor Oliver.

104. Eighteenth Century Literature.—Twice a week; both semesters. *One unit.* Professor Oliver.

127. French Romanticism.—Twice a week; both semesters. *One unit.* Professor Carnahan.

128. Origin and Development of the Novel in France.—Twice a week; both semesters. *One unit.* (Not given in 1934-35.) Professor Carnahan.

129. Research Problems in French Romanticism.—Twice a week; both semesters. *One unit.* (Not given in 1934-35.) Professor Carnahan.

132. French Symbolism in Prose and Verse and the English and American Influences.—Twice a week; both semesters. *One unit.* Professor Michaud.

133. La Poésie de Victor Hugo.—Twice a week; both semesters. *One unit.* (Not given in 1934-35.) Professor Michaud.

144. Le Réalisme et le Naturalisme Français.—(In French.) Twice a week; both semesters. *One unit.* Professor Michaud.

145. Doctrines Littéraires et Courants d'Idées Contemporains.—(In French.) Twice a week; both semesters. *One unit.* (Not given in 1934-35.) Professor Michaud.

175. Old French Phonology and Morphology.—Twice a week; both semesters. *One unit.* (Not given in 1934-35.) Professor Oliver.

195. Seminar.—Research work in preparation for theses in French. Both semesters. *One to two units.* Members of the department.

Courses for Graduates and Advanced Undergraduates

10a–10b. General Survey of French Literature.—Three times a week; both semesters. Professor Carnahan.

17a–17b. French Drama of the Nineteenth Century.—Twice a week; both semesters. Associate Professor Hamilton; Assistant Professor Will.

24a–24b. French Drama of the Seventeenth and Eighteenth Centuries.—Three times a week; both semesters. Professor Oliver.

32a–32b. The French Novel in the Nineteenth Century.—Three times a week; both semesters. Assistant Professor Jacob.

33a–33b. La Littérature Contemporaine.—(In French.) Twice a week; both semesters. Professor Michaud.

34a–34b. La Comédie Humaine de Balzac.—(In French.) Twice a week; both semesters. (Not given in 1934-35.) Professor Michaud.

ITALIAN

Courses for Graduates

140. Italian Literature in the Middle Ages. Petrarch, Boccaccio.—Twice a week; both semesters. *One unit.* Professor Van Horne.

143. Italian Literature in the Renaissance.—Twice a week; both semesters. *One unit.* (Not given in 1934-35.) Professor Van Horne.

146. Modern Italian Literature.—Twice a week; both semesters. *One unit.* (Not given in 1934-35.) Professor Van Horne.

195. Seminar.—Research work in preparation for theses in Italian. Both semesters. *One to two units.* Professor Van Horne.

Course for Graduates and Advanced Undergraduates

3a–3b. Dante: The Divine Comedy.—Twice a week; both semesters. Professor Van Horne.

SPANISH

Courses for Graduates

130. Spanish Literature in the Sixteenth Century.—Twice a week; both semesters. *One unit.* (Not given in 1934-35.) Professor Van Horne.

131. Spanish Literature in the Seventeenth Century.—Twice a week; both semesters. *One unit.* Associate Professor Hamilton.

134. Spanish Literature in the Eighteenth Century.—Twice a week; both semesters. *One unit.* (Not given in 1934-35.) Associate Professor Hamilton.

135. La Novela Española Moderna.—(In Spanish.) Twice a week; both semesters. *One unit.* Associate Professor Balseiro.

137. La Crítica Literaria en España.—Twice a week; both semesters. *One unit.* (Not given in 1934-35.) Associate Professor Balseiro.

138. Spanish-American Literature.—Twice a week; both semesters. *One unit.* Professor Van Horne.

185. Old Spanish Readings.—Twice a week; both semesters. *One unit.* (Not given in 1934-35.) Associate Professor Hamilton.

195. Seminar.—Research work in preparation for theses in Spanish. Both semesters. *One to two units.* Members of the department.

Courses for Graduates and Advanced Undergraduates

10a–10b. General Survey of Spanish Literature.—Three times a week; both semesters. Associate Professor Hamilton.

11a–11b. Cervantes: Don Quixote.—Twice a week; both semesters. Professor Van Horne.

17a–17b. El Teatro Español Moderno.—Twice a week; both semesters. Associate Professor Balseiro.

SOCIOLOGY

Preparation for major work in sociology must include at least the equivalent of twenty-three semester hours in the social and biological sciences, of which at least eight must be in sociology. The remaining fifteen hours may be distributed among economics, philosophy, history, psychology, political science, and biology (heredity). A thesis is required of all candidates for the master's and the doctor's degrees. Preparation for graduate work in sociology as a minor requires at least six hours of credit in sociology.

Courses for Graduates

100. Sociological Theory.—Twice a week; first semester. *One-half to one unit.* Associate Professor Hiller.

102b. More Recent Developments in Sociology.—Twice a week; second semester. *One unit.* (Not given in 1934-35.) Associate Professor Hiller.

106. Urban Communities and Urbanization.—Twice a week; first semester. *One unit.* Assistant Professor Tylor.

107. Rural Communities.—Twice a week; second semester. *One unit.* Assistant Professor Tylor.

108. Research in the Social Effects of Poverty, and Their Prevention and Treatment.—Twice a week; first semester. *One unit.*

109. Research in Criminology.—Twice a week; first semester. *One unit.* Professor Taft.

110. Population.—Twice a week; second semester. *One unit.* Professor Taft.

124. Advanced Penology.—Twice a week; second semester. *One unit.* Professor Taft.

128. Fusion of Culture Resulting from Immigration.—Twice a week; second semester. *One unit.* Associate Professor Hiller.

129. Modern Human Migrations.—Twice a week; first semester. *One unit.* Professor Taft.

150. Seminar.—Preparation of theses. *One-half to two and one-half units.* Members of the department.

Courses for Graduates and Advanced Undergraduates

General Courses

3. Social Evolution.—Three times a week; first or second semester. Mr. Ahrens.

4. Social Control.—Twice a week; second semester. Assistant Professor Albig.

6. Urban Sociology.—Three times a week; first semester. Assistant Professor Tylor.

7. Rural Sociology.—Three times a week; second semester. Assistant Professor Tylor.

Specialized Courses

8. Charities.—Three times a week; first or second semester. Assistant Professor Timmons.

9. Criminology.—Three times a week; first or second semester. Professor Taft.

10. Problems of Population.—Three times a week; second semester. Associate Professor Hiller.

14. Group Opinion.—Three times a week; first or second semester. Assistant Professor Albig.

17. Methods of Sociological Research.—Three times a week; first semester. Associate Professor Hiller.

24. Penology.—Three times a week; second semester. Professor Taft.

27. Community Organization.—Three times a week; second semester. Assistant Professor Timmons.

28. Assimilation and Diffusion of Culture.—Three times a week; second semester. Associate Professor Hiller.

29. Modern Human Migrations.—Three times a week; first semester. Professor Taft.

30. Races of Mankind.—Three times a week; first semester. (Not given in 1934-35.)

40. Ethnology of the American Indians.—Three times a week; first semester. (Not given in 1934-35.)

42. Early Civilizations.—Three times a week; first semester. Assistant Professor Albig.

44. Negro Origins.—Three times a week; second semester. (Not given in 1934-35.)

45. Prehistoric Archeology.—Three times a week; first semester. (Not given in 1934-35.)

THEORETICAL AND APPLIED MECHANICS

The prerequisite for the courses for graduates in theoretical and applied mechanics is the equivalent of the undergraduate courses in theoretical and applied mechanics required for the degree of Bachelor of Science in engineering.

Courses offered to senior students are open for minor credit to students majoring in other departments.

Courses for Graduates

101. The Development of Basic Ideas in Mechanics.—Twice a week; second semester. *One unit.* Professor Moore.

103. Hydraulics.—Twice a week; either semester. *One unit.* Professor Enger.

107. Laboratory Investigations in Strength of Materials.—Twice a week; both semesters. *One-half to two units.* Professor Moore.

108. Laboratory Investigations in Hydraulics.—Twice a week; both semesters. *One to two units.* Professor Enger.

109. Laboratory Investigations in Plain and Reinforced Concrete.—Twice a week; both semesters. *One to two units.* Professor Richart.

110. Analytical Study of Experimental Work on Reinforced Concrete.—Beams, frames, and footings. Twice a week; first semester. *One unit.* Professor Richart.

111. Analytical Study of Experimental Work on Reinforced Concrete.—Columns and slabs. Twice a week; second semester. *One unit.* Professor Richart.

112. Structural Mechanics.—Three times a week; first semester. *One unit.* Professor Westergaard.

113. Selected Topics in Structural Mechanics.—Twice a week; second semester. *One-half unit.* Professor Westergaard.

114. Theory of Elasticity with Applications to Engineering Problems.—Three times a week; first semester. *One unit.* Professor Westergaard.

115. Theory of Elasticity with Applications to Engineering Problems (Continuation of 114).—Twice a week; second semester. *One unit.* Professor Westergaard.

116. Resistance of Materials.—Twice a week; first semester. *One-half to one unit.* Professor Seely.

117. The Properties of Engineering Materials.—Twice a week; second semester. *One-half to one unit.* Professor Seely.

Courses for Graduates and Advanced Undergraduates

41. Advanced Mechanics of Materials.—Three times a week; first semester. Professor Seely.

42. Engineering Materials.—Three times a week; second semester. Professor Seely.

43. Laboratory Work in Hydraulics.—Twice a week; first and second semesters. Professor Enger, Mr. Lansford.

44. Laboratory Work in Testing Materials.—Three times a week; first and second semesters. Professor Moore, Associate Professor Putnam.

TRANSPORTATION

Transportation may be taken as a major or minor for the master's degree and as a minor for the doctorate. No student will be admitted to graduate work in transportation unless he has a satisfactory acquaintance with the principles of economics and in addition such knowledge of the general problems of transportation as is represented by the content of the undergraduate course on the transportation system of the United States.

Course for Graduates

100. Economics of Transportation.—Once a week; both semesters. *One unit.* Assistant Professor Locklin.

Courses for Graduates and Advanced Undergraduates

3. Industrial Traffic Management.—Three times a week; second semester. Assistant Professor Locklin.

7. Railroad Finance.—Three times a week; second semester. Assistant Professor Locklin.

8. Railroad Organization.—Twice a week; first semester. (Not given in 1934-35.)

10. Railroad Rates.—Three times a week; first semester. Assistant Professor Locklin.

16. Railroad Operation.—Three times a week; second semester. (Not given in 1934-35.)

22. Ocean Shipping.—Three times a week; first semester. Professor Litman.

26. Transportation Problems.—Three times a week; second semester. Assistant Professor Locklin.

ZOOLOGY

At least sixteen semester hours of college work in zoology are required for entering on major graduate study in this subject. Under special circumstances advanced work in closely allied subjects may be accepted in lieu of the fourth semester's work in zoology. When zoology is chosen for a minor the courses listed for graduates and undergraduates must be preceded by at least one full year's undergraduate work in zoology.

For the prosecution of graduate study in zoology a reading knowledge of German and French is indispensable and familiarity with Latin and Greek is of great advantage.

Graduate students specializing in zoology are strongly advised to spend at least one summer in study at the seashore. Every candidate for the doctor's degree will be required to furnish evidence of having completed satisfactorily at least one six-week period in such work at an approved location. To facilitate this plan an investigator's room has been provided at the Woods Hole Marine Biological Laboratory, where members of the department are offered research facilities without cost to themselves. Application for the use of this room should be made to the head of the department early in the year. Similar facilities are sometimes afforded at other marine laboratories.

Students interested in the field of genetics are referred especially to courses 115 and 124.

Courses for Graduates

102. Evolution of Vertebrates.—Twice a week; first semester. *One unit.* (Given in alternate years. Not given in 1934-35.) Assistant Professor Adams.

103. Cytology.—Twice a week; both semesters. *One unit.* (Given in 1934-35 and in alternate years.) Professor Shumway.

106. General Embryology.—Problems of development. Twice a week; both semesters. *One unit.* (Given in alternate years. Not given in 1934-35.) Professor Shumway.

109. Physiological Ecology.—Twice a week; second semester. *One-half to one unit.* (Given in 1934-35 and in alternate years.) Professor Shelford.

110. Climatic Ecology.—Twice a week; second semester. *One-half to one unit.* (Given in alternate years. Not given 1934-35.) Professor Shelford.

111. Experimental and Field Ecology.—Both semesters. *One-half to two units.* Professor Shelford.

115. Factors of Individual and Racial Development.—Twice a week; both semesters. *One unit.* Professor Zeleny.

117. Invertebrate Taxonomy.—Twice a week; second semester. *One-half to one unit.* Professor Van Cleave.

118. Advanced Protozoology.—Twice a week; second semester. *One unit.* Assistant Professor Kudo.

131. Helminthology.—Twice a week; first semester. *One-half to one unit.* Professor Van Cleave and Assistant Professor Thomas.

Individual Research Courses

121. Invertebrate Zoology and Parasitology.—*One to two units.* Professor Van Cleave and Assistant Professor Thomas.

122. Vertebrate Morphology.—*One to two units.* Assistant Professor Adams.

124. Experimental Zoology and Genetics. — *One to two units.* Professor Zeleny.

125. Animal Ecology and Behavior.—*One to two units.* Professor Shelford.

126. Vertebrate Embryology and Cytology.—*One to two units.* Professor Shumway.

128. Protozoology.—*One to two units.* Assistant Professor Kudo.

Courses for Graduates and Advanced Undergraduates

9. Animal Ecology.—Three or four times a week; second semester. Professor Shelford.

11. Animal Ecology and Geography.—Three or four times a week; first semester. Professor Shelford.

17. Field Zoology.—Two or three times a week; first semester. Professor Van Cleave.

18. Protozoology.—Twice a week; first semester. Assistant Professor Kudo.

19a–19b. Vertebrate Ecology.—Twice a week; both semesters. Assistant Professor Cahn.

20a–20b. Current Investigations.—Must be taken by all graduate students majoring in zoology. Once a week; both semesters. Members of the department.

21a–21b. Introduction to Zoological Research.—Two to five times a week; both semesters. Members of the department.

22–23. Comparative Anatomy of Vertebrates.—Two to four times a week; both semesters. Assistant Professor Adams.

25. Experimental Genetics.—Two or three times a week; second semester. Dr. Luce.

31. Helminthology.—Twice a week; second semester. Assistant Professor Thomas.

63. Comparative Vertebrate Embryology.—Two to five times a week; first semester. Professor Shumway.

66. Vertebrate Organogeny.—Two to five times a week; second semester. Professor Shumway.

74. Advanced Invertebrate Zoology.—Two or three times a week; second semester. Professor Van Cleave.

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UNIVERSITY OF ILLINOIS

The Graduate School

Announcement for 1935-1936

PUBLISHED BY THE UNIVERSITY OF ILLINOIS
URBANA

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GRADUATE SCHOOL CALENDAR

Summer Session

1935

June 17, Monday.....Registration day.
June 18, Tuesday.....Instruction begun.
July 4, Thursday.....Legal holiday.
July 19, Friday.....Latest date for registering for French and German examinations.
July 26, Friday.....Examination in French.
Aug. 2, Friday.....Examination in German.
Aug. 3, Saturday, 12 M.....Latest date for candidates for degrees in August to deposit theses.
Aug. 9, 10, Friday, Saturday.....Summer session examinations.

First Semester

Sept. 13, 14, Friday, Saturday.....Registration days.
Sept. 14, Saturday, 5 P.M.....Latest date for registration of former students without penalty.
Sept. 16, Monday.....Latest date for candidates for masters' degrees in October to file applications for degrees and to deposit theses.
Sept. 18, Wednesday, 8 A.M.....Instruction begun.
Sept. 21, Saturday.....Latest date for registering for French and German examinations.
Sept. 27, Friday.....Examination in French.
Oct. 3, Thursday.....Latest date for changing study-lists without fee.
Oct. 4, Friday.....Examination in German.
Oct. 15, Tuesday.....Latest date for preliminary examinations (for full residence).
Nov. 4, Monday.....Latest date for candidates for professional engineering degrees to file statements of professional study and experience.
Nov. 27, Wednesday, 12 M.....Thanksgiving recess begun.
Dec. 2, Monday, 1 P.M.....Instruction resumed.
Dec. 21, Saturday, 12 M.....Holiday recess begun.
Dec. 31, Tuesday, 5 P.M.....Latest date for candidates for professional engineering degrees to submit outlines of theses.

1936

Jan. 6, Monday, 8 A.M.....Instruction resumed.
Jan. 18, Saturday.....Latest date for filing applications for masters' degrees to be conferred in February.
Jan. 18, Saturday.....Latest date for candidates for Ph.D. degree in February to deposit theses.
Jan. 18, Saturday.....Latest date for registering for French and German examinations.
Jan. 21, Tuesday.....Semester examinations begun.
Jan. 24, Friday.....Examination in French.
Jan. 29, Wednesday.....Semester examinations ended.

Second Semester

1936

Jan. 31, Friday.....Examination in German.
Jan. 31-Feb. 1, Friday, Saturday.....Registration days.
Feb. 1, Saturday.....Latest date for candidates for masters' degrees in February to deposit theses.
Feb. 1, Saturday, 5 P.M.....Latest date for registration of former students without penalty.
Feb. 5, Wednesday, 8 A.M.....Instruction begun.
Feb. 20, Thursday.....Latest date for changing study-lists without fee.
Feb. 29, Saturday.....Latest date for preliminary examinations (for full residence).
March 2, Monday.....Latest regular date for applications for scholarships and fellowships for 1936-37.
April 1, Wednesday.....Latest date for filing applications for masters' degrees to be conferred in June.
April 9, Thursday, 12 M.....Easter recess begun.
April 14, Tuesday, 1 P.M.....Instruction resumed.
April 18, Saturday.....Latest date for registering for French and German examinations.
April 24, Friday.....Examination in French.
May 1, Friday.....Latest date for candidates for professional engineering degrees to deposit theses.
May 1, Friday.....Examination in German.
May 11, Monday.....Latest date for candidates for Ph.D. degree in June to deposit theses.
May 15, Friday.....Latest date for filing applications for masters' degrees to be conferred in August.
May 15, Friday.....Pre-registration for masters' degrees to be conferred in August.
May 22, Friday.....Semester examinations begun.
May 25, Monday.....Latest date for candidates for masters' degrees in June to deposit theses.
May 25, Monday.....Latest date for Ph.D. finals.
June 1, Monday.....Semester examinations ended.
June 8, Monday.....Sixty-fifth Annual Commencement.

Notes

Examination in one foreign language must be passed before residence on second year may be counted (pp. 13, 16).

Two copies of thesis are required of candidates for masters' and doctors' degrees (pp. 13, 17).

Candidates for masters' degrees announce thesis subjects at beginning of second half-year of work, or after completion of four units, or at beginning of third summer session (p. 13).

Candidates for Ph.D. degree announce thesis subjects within six weeks from beginning of third year of residence (p. 17).

Candidates for Ph.D. degree deposit theses two weeks before date of final examination (p. 17).

THE GRADUATE SCHOOL
EXECUTIVE FACULTY

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THE GRADUATE SCHOOL

History and Organization

The University of Illinois offered facilities for advanced study and research in various lines as early as 1872. Organized graduate instruction, however, under the name of the Graduate School, was first undertaken in 1892. In 1894 the administration of the school was vested in the Council of Administration, and the Vice-President of the University became Dean of the School. In 1906 the Graduate School was organized as a separate faculty.

By action of the Trustees the teaching faculty of the Graduate School includes all members of the University Faculty who give instruction in approved graduate courses. The affairs of the School, however, are in charge of the Executive Faculty.

Admission

Admission to the Graduate School may be granted to graduates of institutions whose requirements for the bachelor's degree are substantially equivalent to those of the University of Illinois and to applicants from other institutions approved by the Executive Faculty, as hereinafter provided. *Admission to the Graduate School does not, however, imply admission to candidacy for an advanced degree, and gives no right or claim to be so admitted. Such candidacy is determined by the faculty after the student has demonstrated by his work here, for from two to five months, that he has the ability to do major work of graduate character. A mere accumulation of "credits" or "grades" is not sufficient.*

Admission to graduate courses may be granted only to those who have had the requisite undergraduate work in those courses or departments. But a student of mature age who satisfies the Dean and the department concerned of his ability to pursue graduate work in a given line may be enrolled in particular graduate courses, without reference to a degree, and permitted to carry on such study or investigation under the direction of a department of the University as the department shall recommend and the Dean approve.

Application blanks for admission may be secured from the Registrar of the University. Every applicant must submit with his application for admission an official transcript of his college record.

Character of Graduate Work

The principal aim of graduate study is the development of the power of independent work and the promotion of the spirit of research. Each candidate for a degree is expected to have a wide knowledge of his subject and of related fields of work; for the graduate student is not expected to get from lecture and laboratory courses all the knowledge and training necessary to meet the requirements for his degree.

Registration and Program of Study

The following regulations concerning registration and program of studies are laid out primarily for first-year students. Second-year and third-year gradu-

ate students fill out their programs irrespective of the unit value of courses, according to their needs, under the advice of their instructors.

Registration.—Each graduate student must register at the beginning of each semester. The registration of a new student may be accepted at any time provided the student is prepared to take up courses actually under way. Credit towards the fulfillment of the residence requirement dates, however, from the time of registration and not from the beginning of the semester or year in which the student enters. Registration will not be permitted later in the year than April 1, except in the case of students who expect to continue through the summer session, or are returning to complete a year's work which has been interrupted by unavoidable circumstances. *No student is permitted to attend any university course in which he is not registered.*

A new student must fill out in duplicate an application for admission and submit it to the Registrar, from whom, after the approval of his application, he will receive a card of admission and a study-list which will give details of procedure in registering. He should fill out the study-list after consultation with his adviser, or the person in charge of his major work, and also with the instructors whose courses he wishes to elect. *Registration, including the payment of fees, must be completed by the close of the registration days of the Graduate School. Otherwise a fee of $5.00 for late registration will be charged all former students.*

Changes in Study-lists.—A graduate student is expected to plan his work so carefully that changes in his study-list during the semester will not be necessary. When a change seems advisable, however, it may be permitted without fee if made within three weeks of the date of registration. After that date a fee of one dollar is charged for each change, except that the total charge for rearrangement authorized on any one change slip shall not exceed two dollars.

Advanced Undergraduate Courses Open to Graduate Students.—

1. *Courses not open to students below senior standing.* Unless otherwise specified on the student's program by the department concerned, such courses listed for four or five hours of undergraduate credit are treated as unit courses for graduate credit, or as half-unit courses when listed for less than four hours of undergraduate credit.

2. *Courses open to students of junior standing.* Unless otherwise specified on the student's program by the department concerned, such courses listed for four or five hours of undergraduate credit are treated as half-unit courses for graduate credit, or as quarter-unit courses when listed for two to three hours undergraduate credit. Courses to which sophomores are regularly admitted may not be taken for graduate credit, either major or minor.

Seniors and Graduate Study.—If at the beginning of the second semester of his senior year a student who has been in residence at least one year is within five hours of a bachelor's degree, he may be permitted to register for courses which may count for residence for a master's degree, provided his program does not require more than twelve formal class, lecture, or laboratory exercises a week, and is approved by the Dean at the time of registration. Only students of excellent record will be allowed this privilege.

Miscellaneous and Listeners' Courses.—Graduate students are permitted under proper circumstances to attend classes as listeners, and to elect miscellaneous subjects, that is, courses which do not count toward an advanced degree. A graduate student in full standing and carrying a minimum program, may be permitted, under proper circumstances, to elect one miscellaneous subject (that is, a course which does not count towards an advanced degree). No subject is open as a miscellaneous course unless it has a specific educational bearing on the student's major or minor subjects of study.

A student who elects a miscellaneous course is required to register in it, do the work, and pass the semester examinations, unless he is permitted to withdraw under the rules. A student who attends as a listener is not permitted to participate in the class work or the examination.

No student may register for a full minimum program of work for graduate credit if it is necessary for him to carry at the same time more than one miscellaneous subject.

Students on the Staff.—Assistants and others on the university staff who undertake to do graduate work are permitted to take an amount of work determined by the terms of their employment. Such a student, if required by his engagements to teach more than five classes a week or to have laboratory work or supervision exceeding ten hours a week, may not receive his master's degree at the end of one year, nor his doctor's degree at the end of three.

Residence and Work Done Elsewhere.—Continuous residence and study are required of all members of the Graduate School, unless they are granted leave of absence by the Dean, upon recommendation of the professor in charge of their work, for the purpose of carrying on elsewhere studies or investigation in the line of work for their degrees.

Graduate Study in the Summer.—Graduate students in the summer session are subject to the same scholastic requirements as those in the regular university year. Their study-lists must be approved by the Dean of the Graduate School, or his representative. Two to two and one-half units of graduate work may be taken in the summer session. Two units is considered a full minimum program for the summer. Attendance during four out of six consecutive summer sessions, or one semester and two summer sessions, is considered the equivalent of one year in residence. The faculty is unwilling to accept summer-session work beyond the master's degree towards the doctor's degree, except in the case of a student who works in a summer session preceding or following a regular year's attendance at the University. In no case may the last year's work for the doctorate be done in disconnected summer sessions.

No course offered in the summer session may be taken for credit towards a higher degree unless it is described in the summer-session circular as accepted for that purpose.

Summer Work in Medical Sciences.—Graduate courses in medical sciences are offered in the summer quarter between June and September at the College of Medicine of the University of Illinois in Chicago. Circulars describing the courses offered and conditions of admission and work may be obtained from the Secretary of the College of Medicine, 1853 W. Polk Street, Chicago.

Failures.—A graduate student who fails in any course in his major subject

cannot secure his degree in the same year in which the failure occurred. No condition examinations are given graduate students.

Withdrawal.—If after registration a graduate student wishes to withdraw from any course or to add other work, he must first secure the necessary papers from the Dean's office. See the regulations concerning changes in study-lists, page 10. If he wishes to withdraw from the University he must get clearance papers at the Dean's office.

Masters' Degrees

Character of Masters' Degrees.—The master's degree conferred depends upon the character of the bachelor's degree. The usual practice is that A.M. shall follow A.B., and that M.S. shall follow B.S. However, this practice may be departed from in cases where the undergraduate course of study of the candidate was of a kind for which some reputable institutions in this country give A.B., while others give B.S.

Amount of Work Required.—Candidates for the degree of Master of Arts or Master of Science are required to do at least one full year's work in residence, usually including a thesis. By this is meant from four to five unit courses each semester or their equivalent. A unit course is one which requires ten hours of time a week through one semester, or a minimum of 180 hours, irrespective of the mode of distribution of that time in class work, laboratory work, and private study. Four such courses or their equivalent constitute a full *minimum* program for one semester, and eight such courses, or their equivalent, constitute the *minimum formal* year's work accepted for a master's degree. Only first-rate students are permitted to secure a degree with this minimum program. In some departments special examinations are required of candidates for masters' degrees. In all cases the student must satisfy the duly approved conditions set by his major and minor departments.

Unless otherwise permitted, every student must take each semester at least one course open to graduate students only (courses numbered 100 and upwards).

In the first year of his graduate study each student is required to attend a minimum of four formal class, lecture, or laboratory exercises a week. He may not attend more than twelve a week without special permission.

Work Done Elsewhere.—Members of the staff and high school teachers residing and employed in Urbana or Champaign who have done graduate work in approved institutions elsewhere may secure credit not to exceed four units towards the master's degree by passing examinations in that work. They may complete the work for the degree by securing at least four units more while registered in the Graduate School for not less than one academic year.

Graduate students who have been in residence one semester or its equivalent may offer for credit not more than nine weeks of work at a marine or fresh-water biological laboratory or in biological or geological field work, on condition that the work be of graduate grade under a qualified instructor or director as certified by the student's major adviser and approved by the Dean of the Graduate School; that approval be obtained by the student in advance; and that a

written report of the work accomplished be presented by the student and approved as satisfactory by the student's major adviser.

Majors and Minors.—A candidate for a master's degree may do all his work in one subject, or he may select a major and one minor, or a major and two minors. A major or minor denotes the field of knowledge of a department, or such part thereof as constitutes a separate and independent division of that field. For a master's degree a major is at least half the work, or a minimum of four units, for one year. Less than one unit may not be counted as satisfying the requirements of a minor without the approval of the department concerned.

Foreign Language.—The ability to use one or more of the modern languages ordinarily studied in the undergraduate curriculum is expected of all candidates for the master's degree, and in some lines of study is required. No student wlil be permitted to acquire residence toward the second year for the doctorate until he has passed the preliminary examination in at least one of these languages.

Masters' Theses.—Each candidate for a master's degree is required to present two copies of a thesis on some subject approved by the professor in charge of his major work. Such approval, except in case of students working for masters' degrees in summer sessions only, must be secured and the subject of the thesis filed at the office of the Graduate School not later than the beginning of the second half year of residence.

Students working for masters' degrees exclusively in summer sessions must announce their thesis subjects not later than the beginning of their third session in residence. The requirement of a thesis may be waived, however, on the recommendation of the professor in charge of his major work and the approval of the Dean, *provided application to waive the thesis is made at the time for announcing thesis subjects.* A student excused from writing a thesis must replace it with courses of instruction.

No one will be excused from writing a thesis unless one-half of his program of studies consists of courses numbered 100 and upwards.

The thesis required from a candidate for a master's degree will ordinarily demand from one to two units of work, and may not exceed three units. The thesis must be typewritten, on "thesis paper,"[1] and the title page must be printed. The carbon copy may be on plain paper of approximately the same weight as the thesis paper. Both copies of the thesis in its final form, together with a certificate of approval by the proper officer, must be left by the professor in charge at the Dean's office at least two weeks before the date on which the degree is to be conferred. No article prepared for another use, or previously published, will be accepted as a thesis.

Applications for Degrees.—Each candidate for the degree of Master of Arts or Master of Science shall file an application for the degree on a blank provided for the purpose, to be had at the Dean's office. For the dates of applications and of deposition of theses, consult the calendar at the beginning of the bulletin.

[1]No other will be accepted by the Dean. "Instructions for the Preparation of Theses" may be obtained at the Dean's office.

Degrees in August.—Students who expect to become candidates for the master's degree in August may be recommended at the June meeting of the Senate subject to the successful completion of the work for which they are to register in the summer session. However, in order to avail themselves of this privilege, students must file with the Dean before the June meeting of the Senate an exact statement of the work necessary to complete the requirements for the degree. Blanks for this purpose may be secured at the Dean's office. For the dates of filing application and pre-registration blanks, consult the calendar at the beginning of the bulletin.

Thesis Work on Leave of Absence.—Under proper conditions a student may be permitted to complete the last fourth of his work, if devoted to his thesis, under leave of absence for a period not to exceed the equivalent of two semesters. To get such permission the student must have secured credit for at least six units; must petition for the privilege; must submit to the Dean an outline of the proposed investigation, approved by the professor in charge of his major work, and must submit satisfactory evidence that adequate facilities are available to him at the place where he intends to do the proposed work. Approval on all these points must be obtained one collegiate year before the thesis is due. Immediately following approval the student must register and pay an incidental fee of $20.00.

Grades.—Students' work is graded in five classes, A, B, C, D, and E. The last indicates a failure. D indicates unsatisfactory, though passable, work.

A student who receives two units of a grade below B during his first year of graduate work may not complete the first year of residence by carrying the minimum program of eight units for the master's degree. Three units of a grade below B disqualify a student as a candidate for a degree.

A failure or absence from examination in any course or failure in any other examination prescribed by the department of the major may prevent the conferring of the degree; and, as already indicated, failure in any course in the major field precludes the conferring of the degree in the same year.

Second Degrees in Engineering

Two classes of second degrees are open to graduates of the College of Engineering, namely, academic and professional.

The *academic* second degree in engineering is Master of Science, following Bachelor of Science, in civil engineering, electrical engineering, etc. This degree is conferred in accordance with the regulations described above for *academic work in residence only.*

The *professional* second degrees in engineering are as follows:

Master of Architecture, after B.S. in architecture.

Architectural Engineer, after B.S. in architectural engineering.

Ceramic Engineer, after B.S. in ceramic engineering.

Chemical Engineer, after B.S. in Chemical Engineering.

Civil Engineer, after B.S. in civil engineering or in railway civil engineering.

Electrical Engineer, after B.S. in electrical engineering or in railway electrical engineering.

Mechanical Engineer, after B.S. in mechanical engineering or in railway mechanical engineering.

Engineer of Mines, after B.S. in mining engineering.

Engineer-Physicist, after B.S. in engineering physics.

Professional degrees in engineering may be conferred on two classes of candidates: (1) those who have received an academic degree in engineering from the University of Illinois; (2) those who have received an academic degree in engineering[1] from other institutions of equal standing and who have been members of the teaching or research staff of the College of Engineering or Engineering Experiment Station or the Department of Chemistry of the University of Illinois for at least three years prior to the conferring of the professional degree.

A candidate declares his candidacy by filing with the Dean of the College of Engineering, as chairman of the committee in charge, a detailed statement covering his professional engineering experience. This statement must be made upon a standard form supplied by the Dean of the College of Engineering, as chairman of the committee in charge, and must be filed not later than the first Monday in November preceding the commencement at which the candidate expects to receive the degree. No statement of experience will be considered by the committee which does not show that the candidate has had a minimum of four years of acceptable engineering experience after receiving the degree of Bachelor of Science, and that for at least three years he has been in responsible charge of engineering work. Responsible charge in engineering teaching may be considered as responsible charge of work. In determining the acceptability of the engineering experience of the candidate the committee will be guided by the character of his professional work and the degree of responsibility involved, and will take into consideration such evidences of professional ability and growth as may be shown by his investigation of engineering problems, his contributions to technical literature, and his membership and activity in engineering societies.

If the professional experience of the candidate is accepted he must submit for approval, prior to December 31, an outline of his proposed thesis. The completed thesis, in the form prescribed in the "Instructions for the Preparation of Masters' and Doctors' Theses," must be deposited with the Dean of the College of Engineering not later than May 1. The candidate must present himself at commencement in order to receive the degree.

A candidate for a professional engineering degree must pay the incidental fee of twenty-five dollars on being notified that his professional experience is accepted as qualifying him to enter as a candidate for the degree. No one will be enrolled as a candidate for the degree at the following commencement who does not pay his fee at this time. When a candidate for a professional engineering degree has once been accepted and paid his fee, he is eligible to receive the degree at any time within five years, without additional fee, on completion of the requirements; provided, however, that unless he completes the requirements within two years his name will be dropped from the list of candidates and in order to receive the degree within the five-year period he must register once more.

The Degree of Doctor of Philosophy

Major and Minor Subjects.—A member of the Graduate School who desires to become a candidate for the degree of Doctor of Philosophy is required

[1]Including chemical engineering.

to pursue a major subject in the department in which his research lies. He is also required to choose one minor subject, or he may choose two. If one minor only is chosen it must be taken in a department of study other than that of the major, and credit for it may be earned by work representing not less than four units, or one-sixth of the total residence required for the doctorate. If two minors are chosen, one must be a subject closely related to the major. With the approval of the adviser it may be a division of the major field of study. The other minor (not less than two units) must, in that case, be taken in a department of study other than that of the major.

Except by special permission of the Dean the preliminary examination in major and minor subjects may not be taken until the minor work has been done.

Method of Computing Residence.—Credit for a full year of graduate work means that the student has during that time devoted all his working time and energy to study of a graduate grade. After the first year of residence, credit is not recorded in units, and there is no fixed correspondence between credit and courses as in undergraduate work. Thus it is possible for a second-year student to devote all his time to one course and his research; and for a third-year student to devote all his time to his research alone.

Period of Study.—The *minimum* period of study required for securing the degree of Doctor of Philosophy is three years, during which the student is required to devote all his working time to his studies. All three years must be spent in resident graduate study at some accredited educational institution and either the first two or the last one of the three must be spent at the University of Illinois. The degree is conferred, however, not for residence during a certain period, but for scholarly attainments and power of investigation, as proved by a thesis and examinations.

Work Done in Other Universities.—Credit for graduate work done in other universities is not "transferred." However, it may be accepted on examination as equivalent to resident work at the University of Illinois, provided the institution in which it was done is of high standing.

Preliminary Examinations.—

A. In Languages.—The student will be required to demonstrate his ability to read French and German and other languages needed in his work. (In special cases the Executive Faculty, upon recommendation of the student's adviser, may substitute for either one of the languages usually required some other language which can be shown to be more useful in that student's professional research.) No student will be permitted to acquire residence towards the second year of graduate study until he has passed the examination in at least one of these languages. Both the examination in French and that in German must be passed before the student is admitted to the preliminary examination in his major and minor subjects. For the dates of these language examinations consult the calendar at the beginning of this bulletin. See calendar for date when application for admission to these examinations must be made.

B. In Major and Minors.—Towards the end of his second year of study, or by special permission, at the beginning of his third year (not later than October 15), a student who wishes to become a candidate for the degree must submit to a preliminary examination. This examination is intended to test the student's knowledge of the fields of his major and minor subjects of study and

to determine whether he is prepared for the final year of work for the doctorate. It is partly oral, and may be wholly so.

The student will not be admitted to his preliminary examination until the faculty is satisfied that he has finished substantially the equivalent of two years' graduate work. He must do a full year's graduate work between his preliminary examination and the completion of his work for the doctorate.

Final Examination.—At least two weeks before the time when the degree is conferred, the candidate must submit to a final examination, given by a committee appointed by the Dean. This examination is primarily on the research work of the student, as embodied in his thesis, but it is not confined to that. It extends to the whole field of study of the candidate. It will not be confined to the courses which the candidate has attended in the University of Illinois only, if he has done part of the work elsewhere; nor even to the field covered by the courses specifically taken in this or other universities; but will be so conducted as to determine whether the candidate has a satisfactory grasp of his major subject as a whole, and a general acquaintance with the fields of knowledge represented by his course of study.

The final examination may not be divided. The examination must be taken all at one time even though it requires several sessions.

If after having passed his preliminary examination, he fails in the third year of his study to meet the expectations of the professors in charge of his work, or in any way fails to maintain the standard of scholarship and power of research expected of him, he may be refused admission to the final examination.

Other Examinations.—Before the candidate is admitted to the final examination and the defense of his thesis, he may be required to take any other examination, oral or written, that is thought proper by the various departments in which he has studied.

The above examinations are in addition to those in the courses for which the student is registered. These must be taken at the time for which they are set in the examination schedule.

Thesis.—The power of independent research must be shown by the production of a thesis on some topic connected with the major subject of study. The candidate is expected to defend his thesis or dissertation before the members of the faculty, or as many of them as may wish to question him about it, in connection with his final examination.

The subject of the thesis should be chosen not later than the end of the second year of residence and must be submitted for formal approval by the faculty not later than six weeks from the beginning of his third year of residence.

Two typewritten copies of the complete thesis, *the original on thesis paper,*[1] and the first carbon on plain paper of approximately the same weight, and in final form, must be deposited in the office of the Dean for presentation to the examining committee not later than two weeks prior to the final examination and not less than four weeks before the time when the degree is conferred. At the same time, the candidate must deposit with the Dean a manuscript of the essential part, or an abstract, or a digest of his thesis, in condition for publication at a cost not to exceed seventy-five dollars ($75). The manuscript must

[1]No other will be accepted by the Dean.

be sufficient to show the method followed, the evidence used, and the conclusions reached in the investigation, and must bear the approval of the department and the Executive Faculty of the Graduate School.

The candidate must pay to the Comptroller before graduation the sum of seventy-five dollars ($75) out of which the University will print at least one hundred copies of this manuscript for circulation by the University, unless the thesis entire or in abbreviated form is published by the author or is accepted for publication by a standard journal or publisher within a year from the date of graduation. In the latter event, and after one hundred copies have been presented to the University by the writer, the cash deposit shall be returned to him.

The typewritten and printed forms of the thesis must comply with the regulations given in "Instructions for the Preparation of Masters' and Doctors' Theses," copies of which may be obtained at the Dean's office.

Degree of Doctor of Philosophy in Engineering

The degree of Doctor of Philosophy in Engineering is offered in certain lines of academic work of a high scholastic type in engineering science for students who wish to prepare themselves as teachers, investigators, and experts.

The general requirements for this degree, as to preliminary education, linguistic attainments, etc., are the same as in other subjects.

The following lines of engineering science, or others approved by the Graduate School, may be elected as majors:

Engineering mechanics
Steam engineering
Hydraulic and sanitary engineering
Electrical engineering
Heating and ventilation engineering
Railway engineering
Masonry construction and structural engineering
Coal-mining engineering
Ceramic engineering
Chemical engineering

The first minor may be any of the above or one of the following sciences or an authorized combination of two of them:

Theoretical mechanics
Mathematics
Thermodynamics
Bacteriology
Chemistry
Geology
Physics (experimental or mathematical)
Zoology
Botany
Economics

The second minor should be in other than engineering subjects.

Agricultural and Engineering Experiment Stations

Attention is called to the unusual opportunities for graduate study in connection with the Agricultural and Engineering Experiment Stations. By under-

taking a line of graduate study in close association with some one of the projects carried on in those Stations, the student will come into contact with aspects of his specialty which he would rarely touch in a purely academic study, and he will thus broaden his outlook. The Experiment Stations make available apparatus, equipment, and the services of mechanicians, which may materially facilitate the carrying on of investigations.

Scholarships and Fellowships

A number of scholarships and fellowships have been established by the Trustees of the University open to candidates who are not over thirty years of age at the time when the appointment is to be made. To first-year graduate students of ability and promise there are open a number of service scholarships with stipends of $300 and carrying exemption from the payment of tuition, incidental, and laboratory fees. There are two classes of fellowships—University Service Fellowships and Honorary Fellowships. The first are open to second-year and third-year graduate students with stipends of $500 and $600, respectively. They are awarded on the condition that their holders shall be available for teaching, research, and other University services not to exceed one-quarter time in each case. No applicant is eligible for a $500 fellowship who has not passed the language examination in either French or German before the regular date for filing applications. To be eligible for a $600 fellowship an applicant must have passed both language examinations before the date for filing applications and must be prepared to take the preliminary examination in his major and minor subjects by the following June. Honorary Fellowships carry no stipends and no exemption from the payment of fees. Their purpose is to give recognition to superior students who are not in need of financial assistance.

Candidates for these scholarships and fellowships must be graduates of the University of Illinois, or of colleges or universities having equivalent requirements for bachelors' degrees.

Application must be made on blanks to be obtained from the Dean of the Graduate School. These application forms should be sent to the Dean of the Graduate School as early as possible in February of the academic year preceding that for which the fellowship is desired. No application will be considered if received later than March first, until after April fifteenth, the date when appointees from the first list of applications must accept or refuse their appointments.

Persons appointed are notified on April first and must send the Secretary of the Board of Trustees notice of their acceptance or refusal by April fifteenth; and must agree that, if accepted, the appointment will not be resigned to take a similar one in any other institution during the year for which it is awarded.

Nominations to fellowships are made on the grounds of worthiness of character, scholastic attainments, and promise of success in the principal line of study or research to which the candidate proposes to devote himself.

The Carr Fellowship in Chemistry.—The Honorable Robert F. Carr, of the class of 1893, gave in 1919 the sum of ten thousand dollars, the income of which is to be used as the stipendium of a fellowship in chemistry or chemical engineering. The stipend is $750.

Libraries

The general university library, including the departmental libraries and reading rooms listed below, are located at the University in Urbana. The libraries of the College of Pharmacy and the College of Medicine are in Chicago.

These libraries contain about 1,006,000 volumes and about 250,000 pamphlets. Of these 954,000 books and 246,000 pamphlets are in the libraries at Urbana; the rest are in Chicago. The library at Urbana also contains about 3,500 maps and 9,900 pieces of sheet music. About 8,000 periodicals are currently received, including over 200 newspapers published in Illinois and about 125 foreign language newspapers published in the United States.

The general library of the University is open daily, from 8 a. m. until 10 p. m. and on Sunday from 2:30 p. m. until 5:30 p. m.

In the book stacks are 140 cubicles for the use of faculty members and graduate students.

A number of departmental and college libraries and reading rooms are maintained in the library and in other buildings on the campus; these libraries do not necessarily contain all the books in the respective subjects. In some instances they are primarily for the use of the graduate students and advanced undergraduate students in the departments using the respective buildings. The principal departmental libraries and reading rooms are the following:

Name of Library	*Location*	*Volumes*
Philosophy, Psychology, and Education	Library Building	8,200
Classics	Library Building	25,000
Modern Languages	Library Building	8,500
English	Library Building	6,800
History and Political Science	Library Building	20,100
Economics, Sociology, and Commerce Reading Room	Library Building	3,500
Natural History	Natural History Hall	55,200
Law	Law Building	41,900
Architecture, Ricker Library of	Architecture Building	11,100
Agriculture Reading Room	New Agriculture Building	24,500
Chemistry	Chemistry Building	14,900
Physics	Physics Building	1,600
Mathematics	Mathematics Building	11,800
Engineering	Engineering Hall	34,600

The library includes most of the bibliographical aids published for the book-trade in this and other countries; a Union Card Catalog of books in seven other large American libraries; many printed catalogs of important libraries, e.g., Catalogue of Printed Books in the British Museum, Gesamtkatalog der Preussischen Bibliotheken, and Catalogue Général des livres imprimés de la Bibliothèque Nationale; and many bibliographies of special subjects.

The following brief statements indicate the resources of the library for research in a few subjects selected at random:

Official publications of municipalities number about 32,000 reports, charters and ordinances, issued by over 3,000 American and 300 foreign municipalities, and more or less complete files of about 50 municipal periodicals. Systematic attempts are made to secure current publications, especially of Illinois municipalities.

Mathematics numbers over 11,000 volumes, about 9,500 dissertations and other pamphlets, and includes files of over 300 periodicals and other serials.

Chemistry includes about 10,100 volumes of bound periodicals, 4,700 other books, 1,500 pamphlets, 7,200 theses, and receives currently 255 journals, most of which are complete sets.

Italian history includes the Cavagna Library, 40,000 volumes, pamphlets, and maps, and 138 bundles of manuscripts with typed partial index to families and places dealt with; much material of Italian local history, biography, and genealogy.

Classical literature, history, and archaeology embraces approximately 30,000 volumes, including complete sets of about 150 journals and serials; the library of Professor Wilhelm Dittenberger, of Halle, 5,600 items acquired in 1907; the library of Professor Johannes Vahlen, of Berlin, 10,000 items acquired in 1913; and a collection of about 17,000 dissertations, reprints, etc.

The Ricker Library of Architecture numbers 11,100 volumes, 10,500 lantern slides, and 9,000 photographs and drawings. It is not only a good working library for faculty and students in architecture, but contains many of the older and rarer works.

Fees and Expenses

Except as noted below, graduate students pay fees as follows:

Matriculation fee	$10.00
Incidental fee, each semester, for residents of Illinois	35.00
All students, not residents of Illinois, pay each semester an incidental fee of	62.50
Incidental fee for students registered for thesis work towards the master's degree on leave of absence	20.00
Graduation fee	10.00
For late registration	5.00
For change in study-list	1.00

All persons on University appointment or on appointment in allied surveys and laboratories in Urbana and the research and educational hospitals in Chicago, eligible for admission to University work, also superintendents, principals, and teachers employed in the public school systems of Illinois and teachers and members of the staff in colleges and universities in this state, when admitted to instruction in the University during the period of their employment, may be permitted to attend University classes for credit, on condition that they register and pay either the regular incidental fees in the Graduate School, or, at their election, fees assessed as follows:

For undergraduate and professional work in the colleges and schools at Urbana, $2.50 a credit hour.

For graduate work at Urbana or Chicago, at the rate of $10 a unit; provided, however, that persons on scholarship or fellowship appointment in the Graduate School, or on University appointment at a salary of $1,600 a year or less, who are registered in the Graduate School, shall be exempt from the payment of such fees, and from laboratory fees, in courses for graduate credit.

All persons shall pay the matriculation and graduation fees.

Table board may be obtained at prices ranging from $5 to $7 a week.

Room rent, single room, ranges from $15 to $25 a month; double room, from $10 to $15 a month, each person.

The Graduate Club

The Graduate Club is an unofficial organization of the graduate students and faculty. Its purpose is to furnish an opportunity for those working in different departments to become acquainted with one another and thus counteract the tendency toward narrowness which intense specialization may sometimes induce.

DEPARTMENTS OF INSTRUCTION

Courses open to graduate students are of two classes. The first class is wholly of graduate grade, and the courses are numbered 100 upwards. The second class includes the courses classified as for graduates and advanced undergraduates. These carry numbers below 100. The courses numbered 100 and upwards are all accepted for major credit. Those of the other group are in many cases accepted for minor credit only. This is especially true of courses which are open to juniors.

All courses have certain prerequisites for admission. Inasmuch as the prerequisite preparation may be gained at other institutions from courses differing from those offering a similar preparation at the University of Illinois, so that a statement of prerequisites as given here would not be understood elsewhere, their description is omitted altogether. However, a student who wishes to enter a particular course must satisfy the department concerned that he has had in some form the prerequisites for admission to the course.

For the convenience of first-year students the credit value of graduate courses is given in units. These values have no significance for second-year and third-year students.

The credit received for "courses for graduates and advanced undergraduates" is in accordance with the regulations of the Graduate School (see page 10).

Students are admitted to graduate standing in agriculture who have had a thorough training in the sciences underlying agriculture, and who are otherwise eligible to the Graduate School, even though their undergraduate course of study lacked to some extent the amount and kind of technical work in agriculture included in the course of study for the bachelor's degree in agriculture at the University of Illinois.

ACCOUNTANCY

A student may major in accountancy for the master's degree only. The courses may be taken for minor credit by applicants for the master's or doctor's degree in other departments with the approval of the adviser. The courses in accountancy for graduates only may be selected by those who have had approximately 15 university credits in accountancy, including Accountancy 3a or its equivalent. Accountancy 4a is a prerequisite for 104; 3b for 110; 13 for 113; and 20 for 120.

The courses for graduates and advanced undergraduates may be taken by those who have had the equivalent of 12 university credits in accountancy.

Courses for Graduates

103. Advanced Theory and History.—Twice a week; both semesters. *One unit.* Professor Littleton.

104. Accounting Systems.—Twice a week; both semesters. *One unit.* Professor Scovill.

113. Governmental Accounting.—Twice a week; second semester. *One unit.* Professor Morey.

120. Income Tax Development.—Twice a week; first semester. *One unit.* Professor Filbey.

129. Thesis.—Once a week; both semesters. *One unit.* Professor Littleton and members of the staff.

Courses for Graduates and Advanced Undergraduates

3a. Advanced Accounting.—Three times a week; either semester. Professors Filbey, Littleton.

3b. Auditing.—Three times a week; either semester. Professor Filbey.

4a. Cost Accounting.—Twice a week; either semester. Professor Schlatter.

4b. Accounting Systems.—Twice a week; either semester. Assistant Professor Baily.

5a–5b. C.P.A. Problems.—Three times a week; both semesters. Professor Scovill.

13. Governmental Accounting.—Twice a week; either semester. Professor Morey, Dr. Hackett.

20. Income Tax Procedure.—Twice a week; second semester. Professor Filbey.

30. Budgets and Accounting Control.—Three times a week; either semester. Associate Professor Theiss.

AGRICULTURAL ECONOMICS

Graduate students in agricultural economics may do their work in the general field of agricultural economics or specialize in any one of the following: (1) farm organization and management; (2) land economics; (3) agricultural marketing; and (4) agricultural prices and statistics.

Graduate work in agricultural economics as a major subject is open to students under either of two conditions: (1) the student must have done at least 20 hours of undergraduate work in economics, agricultural economics, business organization and operation, accountancy, history, political science, or sociology, of which at least 12 hours must have been in the field of economics and agricultural economics; or (2) the student must have had a thorough training in the principles of agricultural economics consisting of at least 12 hours credit in economics and agricultural economics, either in connection with or in addition to a course of study in agriculture substantially equivalent to that required for the bachelor's degree in agriculture in this University.

To take agricultural economics as a minor, the student must have had at least 20 hours work in agricultural and economic subjects. Two units in agricultural economics will be accepted as satisfying this requirement.

Graduate students who are making agricultural economics their major are required to take at least one course in advanced economic theory. Where such students are taking two minors in other departments, one of them must be in economics, business organization and operation, accountancy, sociology, history, or political science.

Certain courses given in other departments are closely related to those in agricultural economics. A graduate student whose major is in agricultural eco-

nomics may be permitted, on approval of the departments concerned, to take such courses as part of his major work. Attention is called to graduate courses in economics, accountancy, business organization and operation, and sociology, as well as those in other departments in the College of Agriculture.

Courses for Graduates

109. Seminar. Thesis Course.—All graduate students majoring in Agricultural Economics must register in Agricultural Economics 109; credit is conditional upon the completion of an acceptable thesis. Once a week; both semesters. *One to two units.* Members of the department.

110. Theory of Agricultural Economics.—Twice a week; both semesters. *One unit.* Associate Professor Stewart.

111. Agricultural Prices and Statistics.—Twice a week; both semesters. *One unit.* Assistant Professor Bartlett.

112. Agricultural Economics Research.—Credit is conditional upon the completion of an acceptable report of investigation. Once a week; both semesters. *One to two units.* Members of the department.

120. Farm Management Principles and Investigational Methods.—Twice a week; both semesters. *One unit.* Professor Case.

135. Marketing Fruits and Vegetables.—Once a week; first semester. *One to two units.* Professor Lloyd.

Courses for Graduates and Advanced Undergraduates

10. Economic Relationships of Agriculture.—Three times a week; first semester.

14. Cooperation in Agriculture.—Twice a week; second semester. Assistant Professor Bartlett.

15. Financing Agriculture.—Three times a week; second semester. Dr. Jordan.

17. Economic History of Agriculture.—Twice a week; first semester.

18. Land Economics.—Three times a week; second semester. Associate Professor Stewart.

22. Types and Systems of Farming.—Required field trip, expense about $3. Three times a week; first semester. Associate Professor Wilcox.

23. Farm Business Analysis.—Required field trip, expense about $5. Three times a week; second semester. Mr. Wills.

24. Farm Operation.—Required field trip, expense about $3. Twice a week; first semester. Mr. Wills.

25. Farm Organization.—Required field trip, expense about $5. Three times a week; second semester. Professor Case, Mr. Ackerman.

26. Farm Administration.—Twice a week; first semester. Professor Case, Mr. Ackerman.

31. Grain Grading and Marketing.—Required inspection trip, expense about $15. Three times a week; second semester. Associate Professor Pieper.

34. Marketing Dairy Products.—Twice a week; second semester. Assistant Professor Bartlett.

36. Marketing Horticultural Products.—For seniors and graduates specializing in horticulture. Inspection trip required; estimated cost, $12. Three times a week; first semester. Professor Lloyd.

37. Marketing Livestock.—Twice a week; second semester. Associate Professor Ashby.

41. Problems in Agricultural Economics.—Once a week; both semesters.

(a) Agricultural Marketing.—Members of the department.
(b) Agricultural Prices and Statistics.—Members of the department.
(c) Farm Organization and Management.—Professor Case.
(d) Land Economics.—Associate Professor Stewart.

42. Farm Appraisals.—Local field trips to be arranged; estimated cost, $5. Four times a week; second semester. Members of departments involved.

AGRONOMY

Graduate students may take work in agronomy leading to the M.S. and Ph.D. degrees. They may specialize for either degree in soil fertility, soil physics, soil biology, plant breeding, or crop production.

For either degree, if two minors are chosen, the first should be, and both first and second may be, taken in a department other than agronomy. If only one minor is chosen, it must be in a field outside of the department.

A candidate for the master's degree in agronomy must present an acceptable thesis, and show proficiency in his work as demonstrated by suitable examinations, prescribed by the department.

Fifteen college credits in agronomy and related subjects are prerequisites for a minor, and five additional credits are prerequisites for a major. Students must have had the fundamental work in science, prerequisite to the major and minor fields of study. Those with unusually good training in science may be permitted by the department to waive certain of the above mentioned requirements.

Courses for Graduates

101. Chemical Properties of Soils; Their Relation to Soil Development and Plant Growth.—Twice a week; first semester. *One unit.* Professor DeTurk.

104. Seminar.—Once a week; both semesters. *One-fourth unit.* The Graduate Staff.

112. Theory and Analysis of Plant Breeding Problems.—Three times a week; first semester. *One unit.* Professor Woodworth.

114. Principles Underlying the Production of Crops.—Twice a week; second semester. *One unit.* Professor Burlison, Associate Professor Dungan.

118. Research.—A special problem is chosen by each student. Graduate students writing theses should so indicate in registering in Agronomy 118. Both semesters. *One-half to four units.*

(a) Soils.—Professors Bauer, DeTurk, R. S. Smith.
(b) Crops.—Professors Burlison, Woodworth, Associate Professor Dungan.

119. Experiment Station Problems.—See Animal Husbandry 103.

Courses for Graduates and Advanced Undergraduates

7. Crop Production as Affected by Environmental Factors.—Three times a week; first semester. Professor Burlison, Associate Professor Dungan.

10. Genesis, Morphology, Classification, and Geography of Soils.—Three times a week; second semester. Professor R. S. Smith.

11. Rôle of Micro-organisms in Soil Fertility.—Three times a week; first semester. Associate Professor Sears.

13. Soil Productivity, its Variation, Modification, and Maintenance.—Three times a week; second semester. Professor Bauer.

22. Improvement of Farm Crops by Breeding.—Three times a week; second semester. Professor Woodworth, Dr. Bonnett.

29. Principles of Field Plot Experimentation.—Three times a week; first semester. (Given in alternate years; not given in 1935-36.) Professor Woodworth, Mr. Mumm.

30. Metabolism of Soil Micro-organisms.—Three times a week; second semester. (Given in 1935-36 and in alternate years.) Associate Professor Sears.

31. Biological Methods of Soil Investigation.—Three times a week; second semester. (Given in alternate years; not given in 1935-36.) Associate Professor Sears.

32. Physical Methods of Soil Investigation.—Three times a week; first semester. (Given in alternate years; not given in 1935-36.) Dr. Stauffer.

33. Chemical Methods of Soil Investigation.—Three times a week; first semester. (Given in 1935-36 and in alternate years.) Professor DeTurk.

ANIMAL HUSBANDRY

The department of animal husbandry offers graduate work leading to the degree of Master of Science and the degree of Doctor of Philosophy. For a major or minor for the master's degree the student may specialize in the general field of animal production, or in the special fields of animal genetics, animal nutrition, animal pathology and poultry husbandry. For a major or minor for the doctor's degree he may specialize in animal genetics, the economics of meat production, animal nutrition, and animal pathology. Advanced work in poultry husbandry may be taken for a minor for the doctor's degree.

For registration for a minor in animal husbandry a student must offer at least 15 college credits in the field, including the principles of feeding, the principles of genetics, livestock production and livestock judging, and he must have had an introductory course in organic chemistry. For a major a student must offer at least 5 additional college credits in animal husbandry or in courses related to the major field of specialization. Besides these general requirements, a student must have had the special training required for effective graduate study in the field of his chosen major: For work in animal production, the economics of meat production; for work in poultry husbandry, an introductory course in farm management; for work in animal genetics, at least an introductory course in general zoology; for work in animal nutrition, a satisfactory course in quantitative chemical analysis, and preferably also a course in animal physiology; for work in animal pathology, training in histology, physiology, bacteriology, and hygiene. Attention is also directed to the advisability of including in undergraduate preparation for graduate work in any phase of animal husbandry at least introductory training in French or German and in mathematics.

In the case of students with an unusually thorough training in science who wish to pursue graduate work in some special field of animal husbandry from a non-agricultural viewpoint, the department may waive certain of the above requirements.

Students who desire to become candidates for the doctorate and who register for a minor in the general fields of animal production or the economics of meat production must take Animal Husbandry 7 and 41, if they have not taken these courses or their equivalents during their undergraduate training. Such students registering for a major in these general fields must take in addition Animal Husbandry 31, and most students so majoring will find it desirable to register in Animal Husbandry 35.

Courses for Graduates

103. Experiment Station Problems.—Organization and administration of research; objects, methods, and the sources of error in experimental work. Open to graduate students in all the departments of the College of Agriculture. Once a week; second semester. *One-half unit.* Professor Mumford.

112. Research.—Investigations along the following lines:
   (a) Economic Factors Involved in Meat Production.—Professors Rusk, Carroll.
   (b) Systems of Livestock Farming.—Professor Case.
   (c) Animal Pathology.—Professor Graham.
   (d) Animal Nutrition.—The chemistry of feeding stuffs; metabolism experiments and biochemical studies connected with the nutrition of farm animals. Professor Mitchell.
   (e) Animal Genetics.—Associate Professor Roberts.
   (f) Problems in Poultry Husbandry.—Professor Card.

One to three times a week; both semesters. *One-half to two units.* These courses may be taken during the summer by special permission.

117. Animal Genetics.—Two to three times a week; both semesters. *One unit.* Associate Professor Roberts.

118. Animal Nutrition Seminar.—A review of current literature in animal nutrition. Two hours a week; both semesters. *One-half unit.* Professor Mitchell.

119. Laboratory Methods in Animal Nutrition.—Two to five times a week; both semesters. *One-half to one unit.* Professor Mitchell.

120. Laboratory Methods in the Diagnosis of Animal Diseases.—Two to five times a week; both semesters. *One-half to one unit.* Professor Graham.

121. Laboratory Methods in Animal Genetics.—Two to five times a week; both semesters. *One-half to one unit.* Associate Professor Roberts.

Courses for Graduates and Advanced Undergraduates

7. Principles of Animal Nutrition.—Five times a week; first semester. Mr. Hamilton.

22. Advanced Stock Judging.—Five times a week; first semester. Members of the department.

24. Meat Judging and Special Problems.—Two to five times a week; first semester. Associate Professor Bull.

25. Beef Production.—Three times a week; first semester. Professor Rusk, Associate Professor Snapp.

26. Pork Production.—Three times a week; first semester. Professor Carroll.

27. Sheep Husbandry.—Twice a week; second semester. Assistant Professor Kammlade.

28. History of Breeds of Livestock.—Three times a week; second semester. Professor Edmonds and other members of the department.

31. Advanced Course in Animal Nutrition.—Three times a week; second semester. Professor Mitchell.

33. Horse Production.—Three times a week; second semester. Professor Edmonds, Mr. Crawford.

35. Animal Hygiene and Sanitation.—Twice a week; second semester. Professor Graham.

39. Poultry Production.—Three times a week; second semester. Professor Card.

40. Economics of Poultry Keeping.—Three times a week; first semester. Professor Card.

41. Animal Genetics.—Three times a week; second semester. Associate Professor Roberts.

ARCHITECTURE AND ARCHITECTURAL ENGINEERING

The prerequisite for graduate work in the Department of Architecture is the equivalent of the undergraduate courses required at the University of Illinois for the bachelor's degree in the department in the branches of the subjects in which registration is desired.

Courses for Graduates

101. Architectural Construction.—Theory and design. Twice a week; both semesters. *One-half to two units.* Professor Palmer.

103. Architectural Construction.—Special problems. Twice a week; both semesters. *One-half to two units.* Associate Professor Morgan.

104. Architectural Design.—Advanced course. Twice a week; both semesters. *One to three units.* Professor Deam.

105. Architectural Practice.—Research in special topics. Once a week; both semesters. *One-fourth to one-half unit.* Professor Provine.

106. Architectural History.—Special research. Twice a week; both semesters. *One-half to two units.* Professor Newcomb.

ASTRONOMY

The prerequisites for graduate study in astronomy are mathematics through calculus, a year's course in descriptive astronomy, and a course in college physics.

Courses for Graduates

101. Seminar.—Three times a week; both semesters. *One unit.* Professor Baker.

103. Celestial Mechanics.—Three times a week; both semesters. *One unit.* Professor Baker.

Courses for Graduates and Advanced Undergraduates

9. Astrophysics.—Three times a week; second semester. Professor Baker.

15. Geodetic Astronomy.—Three times a week; first semester. Professor Baker.

BACTERIOLOGY

Students electing bacteriology as a major study must have had at least 10 semester hours of bacteriology and 15 semester hours of some other physical or biological science. Before receiving a degree a student must have had work equivalent to courses 20, 8, 26, 103, and 107; candidates for the doctor's degree will be held responsible for a general knowledge of the subject as applied to plant pathology, dairy husbandry (dairy bacteriology), and soil biology. Courses in these subjects are listed under their respective departments and will be counted, after conference with adviser, toward the requirements for the doctor's degree.

In addition to the usual examinations in courses, each candidate for the master's degree will be required to pass a general written examination toward the close of the second semester of residence.

Candidates for the doctor's degree with a major study in another field than bacteriology, who elect a first or second minor in bacteriology, must offer a minimum of three units for the first minor and two and one-half units for the second minor selected from the courses offered in this department, or, for satisfactory reasons, certain courses in the departments mentioned above. These courses must include course 103 and one advanced laboratory course in the department of bacteriology.

NOTE: The attention of students is called also to courses in bacteriology offered in other departments. Certain of these courses must be elected toward requirements for advanced degrees after conference with adviser.

Courses for Graduates

103. PHYSIOLOGY OF BACTERIA.—Twice a week; first semester. *One unit.* Professor TANNER.

107. RESEARCH.—For those students who are taking a major in bacteriology either for the doctor's degree or master's degree. Both semesters. *One-half to four units.* Professor TANNER, Assistant Professor WALLACE.

118a–118b. CURRENT LITERATURE.—Required of all graduate students majoring in bacteriology. Once a week; both semesters. *One-fourth unit.* Professor TANNER.

Courses for Graduates and Advanced Undergraduates

8. FOOD BACTERIOLOGY.—Water, sewage, and food bacteria. Five times a week; second semester. Professor TANNER, Dr. CLARK.

10. EPIDEMIOLOGY.—Twice a week; second semester. Assistant Professor WALLACE.

20. GENERAL BACTERIOLOGY.—For seniors and graduate students. Five times a week. Assistant Professor WALLACE.

26. PATHOGENIC BACTERIOLOGY AND IMMUNOLOGY.—Five times a week; first semester. Assistant Professor WALLACE.

BOTANY

Candidates for advanced degrees in botany must offer for admission at least 20 hours in botany inclusive of courses 2 or 12 and 3, or 15 hours in botany and 5 hours in a related subject acceptable to the department. Graduate students who elect botany for minor credit must offer 15 hours in botany, or 10 hours in botany and 5 hours in a related subject acceptable to the department.

The department wishes to call the attention of graduate students to courses in agronomy and soils, bacteriology, chemistry, entomology, geography, geology, horticulture, mathematics, physics, physiology, and zoology which are available to advanced students and offer a broad foundation for the different phases of botanical work. The practical work in plant sciences in the College of Agriculture and the Experiment Station offers unusual facilities to the graduate student. Joint majors may be arranged in botany and agronomy.

Courses for Graduates

110. Botanical Discussions.—Required of all students and of members of the instructional staff. Once a week; both semesters. No credit.

112. Discussions in Plant Morphology.—Once a week; both semesters. *One-fourth unit.* Professor Buchholz.

113. Discussions in Physiology.—Once a week; both semesters. *One-fourth unit.* Professor Hottes.

117. Discussions in Pathology and Mycology.—Once a week; both semesters. *One-fourth unit.* Professor Stevens.

118. Discussions in Plant Ecology and Plant Geography.—Once a week; both semesters. *One-fourth unit.* Associate Professor Vestal.

Research Courses

120. Morphology.—Once or twice a week; both semesters. *One-half to two units.* (Botany 112 to be taken concurrently.) Professor Buchholz.

130. Physiology.—Once or twice a week; both semesters. *One-half to two units.* (Botany 113 to be taken concurrently.) Professor Hottes.

170. Pathology or Mycology.—Once or twice a week; both semesters. *One-half to two units.* (Botany 117 to be taken concurrently.) Professor ———.

180. Plant Ecology or Plant Geography.—Once or twice a week; both semesters. *One-half to two units.* (Botany 118 to be taken concurrently.) Associate Professor Vestal.

Courses for Graduates and Advanced Undergraduates

20. Cytology.—Once or twice a week; second semester. (Given in 1935-36 and in alternate years.) Professor Buchholz.

33. Physiology.—Growth, and the effect of environment on growth. Once or twice a week; first semester. Professor Hottes.

34. Physiology.—Respiration, and the effects of the environment and food on energy release. Once or twice a week; second semester. Professor Hottes.

41. Cryptogamic Botany.—Algae, Fungi, and Bryophytes. Once or twice a week; second semester. Professor ————, Dr. Hague.

43. Pteridophytes.—Comparative morphology. Once or twice a week; first semester. (Given in alternate years; not given in 1935-36.) Professor Buchholz.

44. Spermatophytes.—Comparative morphology. Once or twice a week; second semester. (Given in alternate years; not given in 1935-36.) Professor Buchholz.

45. Histology, Anatomy, and Technique.—Once or twice a week; first semester. Professor Buchholz.

46. Heredity and Evolution.—The cell in inheritance, environment, adaptation, and evolution. Once or twice a week; first semester. (Given in 1935-36 and in alternate years.) Professor Buchholz.

56. Plant Geography.—Regional divisions of the continents; plants and vegetation of each region in relation to climate, soil, and topography. Once or twice a week; first semester. Associate Professor Vestal.

60. Systematic Botany.—Phylogenetic study of flowering plants. Relationship of the principal orders and families, rules of taxonomy and the identification of species. Once or twice a week; first semester. (Given in alternate years; not given in 1935-36.) Dr. Fuller.

70. Taxonomy of Pathogenic Fungi.—Myxomycetes, Bacteria, Phycomycetes and Ascomycetes. Once or twice a week; first semester. Professor ————.

77. Taxonomy of Pathogenic Fungi.—Basidiomycetes and Fungi Imperfecti. Once or twice a week; second semester. Professor ————.

81. Plant Ecology.—Relation to environment and distribution of individual plants and of vegetation (communities). Once or twice a week; first semester. Associate Professor Vestal.

88. Plant Communities and Environment.—Analysis of the environment complex; responses of plants; communities, including smaller units of vegetation. Once or twice a week; second semester. Associate Professor Vestal.

BUSINESS ORGANIZATION AND OPERATION

Work may be done in the field of business organization and operation for a major or a minor for the M.S. degree, and for a minor for the doctorate. To do major work in this field, the student must have completed an undergraduate curriculum equivalent to that of the College of Commerce and Business Administration. To do minor work, he must have had at least five semester hours' credit in the principles of economics, also Business Organization and Operation 1 and 2 or the equivalent. Business Organization and Operation 1 is a prerequisite for 104.

Courses for Graduates

102. Marketing Research and Policies.—Twice a week; both semesters. *One unit.* Professor Converse.

104. Scientific Management.—A study of modern management methods and procedures, particularly as they apply to industrial enterprises. Twice a week; both semesters. *One unit.* Professor Anderson.

107. Sales Campaigns.—Twice a week; both semesters. *One unit.* Professor Russell.

129. Thesis.—Time to be arranged; both semesters. *One unit.* Professor Russell and others.

Courses for Graduates and Advanced Undergraduates

3. Retail and Chain Store Organization and Operation.—Three times a week; second semester. Mr. Whitlo.

4. Management in Manufacturing.—Three times a week; either semester. Professor Anderson.

7. Salesmanship.—Twice a week; either semester. Dr. Jones.

8. Advertising.—Three times a week; either semester. Professor Russell.

9. Trade and Civic Organizations.—Twice a week; second semester. Dr. Bruce.

17. Sales Management.—Twice a week; either semester. Mr. Heslip.

18. Advertising Campaigns.—Three times a week; second semester. Professor Russell.

20. Credits and Collections.—Three times a week; either semester. Dr. Huegy.

22. Marketing Research and Policies.—Twice a week; second semester. Professor Converse.

75. Management of Public Utilities.—Three times a week; first semester. Assistant Professor Gray.

BUSINESS LAW

Course for Graduates and Advanced Undergraduates

10. Law of Security Relations and Banking.—Three times a week; either semester. Associate Professor Dillavou.

CERAMIC ENGINEERING

This department offers graduate work leading to the degrees of Master of Science in Ceramics, Master of Science in Ceramic Engineering, Doctor of Philosophy in Chemistry (Ceramic Chemistry), and Doctor of Philosophy in Engineering.

The prerequisite for majoring in graduate work in ceramics or ceramic engineering is proficiency in the undergraduate courses required for the degree of Bachelor of Science in the branch of the subject in which registration is desired, or substantial equivalents.

Candidates for the degree of Doctor of Philosophy in Chemistry (Ceramic Chemistry) must have had the equivalent of at least 25 semester hours of satisfactory courses in general, analytical, physical, and organic chemistry; also calculus, one year of college physics, one semester of optical mineralogy, and at least 18 semester hours or their equivalent in acceptable ceramic courses.

Courses for Graduates

101a-101b. The Chemistry of the Compounds of Silicon.—Twice a week; both semesters. *One unit.* Professor Parmelee.

102. General Technology of the Clay Industries.—Twice a week; both semesters. *One to two units.* Professors Parmelee, Hursh, Andrews.

103. Chemistry of Silicates.—Laboratory to supplement Ceramic Engineering 101, which must precede or accompany it. Both semesters. *One to two units.* Professor Parmelee.

104. Technology of Glass.—Twice a week; second semester. *One to two units.* Professor Parmelee.

105. Methods of Ceramic Research.—Twice a week; second semester. *One unit.* Professor Parmelee.

106. Research.—Professors Parmelee, Hursh, Andrews.

Courses for Graduates and Advanced Undergraduates

5. Ceramic Bodies.—Five times a week; first semester. Professor Parmelee.

7. Structural Clay Products.—Three times a week; first semester. Professor Andrews.

8. Glass Technology.—Twice a week; second semester. Professor Parmelee.

10. Cements.—Twice a week; second semester. Professor Andrews.
11. Drying Clay Products.—Three times a week; second semester. Professor Hursh.
14. Glasses and Glazes.—Three times a week; second semester. Professor Parmelee.
16. Enamels.—Three times a week; first semester. Professor Andrews.
18. Ceramic Microscopy.—Three times a week; first semester. Mr. Thompson.
20. Refractory Materials.—Twice a week; second semester. Professor Andrews.
22. Kilns and the Burning of Clay Products.—Three times a week; first semester. Professor Hursh.
23. Dryer and Kiln Design.—Twice a week; first semester. Professor Hursh.
24. Ceramic Engineering Design.—Three times a week; second semester. Professor Hursh.
28. Pyrochemical Problems.—Twice a week; second semester. Professor Andrews.

CHEMISTRY

Graduate students whose major subject is in some department other than chemistry, before taking graduate work for credit in this department, must have had the equivalent of 15 university credits in chemistry, and the ground covered should include satisfactory work in general chemistry and in qualitative and quantitative analysis and elementary organic chemistry. Such students are advised to make selections from the following courses: Chemistry 40, 41, 42, 43, 27, 36b and 37b, 50a, 60a, 15a, 16a and 29b. Courses of a more special nature will not as a rule be accepted for graduate work unless preceded by one of the courses above. Graduate students who are candidates for an advanced degree in chemistry or engineering (chemical engineering) must have had the equivalent of 25 university credits in chemistry properly distributed.

Graduate students whose major subject is in some department other than chemistry and who intend to take a first minor in chemistry or any branch of chemistry toward the Ph.D. degree must include among the courses taken, Chemistry 40 and 41, or must have had the equivalent.

Graduate students who are candidates for the A.M. or M.S. degree in chemistry must include in the courses taken Chemistry 40 and 41 or must have had the equivalent. Graduate students who are candidates for the Ph.D. degree in any branch of chemistry or engineering (chemical engineering) must include among their courses Chemistry 40, 41, 42, and 43 or must have had the equivalent.

Students who intend to take graduate work in chemistry or engineering (chemical engineering) should include in their undergraduate preparation at least the equivalent of one full year of physics, one year of French, one year of German, mathematics through differential and integral calculus. Any student without these subjects may enter the Graduate School but will be required to spend part of his time in residence on the above-mentioned subjects.

Candidates for the degree of Ph.D. in engineering (chemical engineering) must have completed an undergraduate training in chemical engineering com-

parable to that offered in the chemical engineering curriculum at the University of Illinois.

Courses for Graduates

Inorganic Chemistry

101a–101b. Inorganic Chemistry.—The less familiar elements and their relationship in the periodic system. Lectures; recitations. Twice a week; both semesters. *One-half unit.* Professor Hopkins.

102a–102b. Inorganic Chemistry.—(Laboratory.) Inorganic preparations and qualitative analysis of the less familiar elements. To accompany or follow Chemistry 101a–101b. One to three times a week; both semesters. *One-fourth to three-fourths unit.* Professor Hopkins.

105a-105b. Inorganic Chemistry. — (Seminar and Special Topics.) Current literature; special topics for 1935-36: First semester, Mechanism of Reactions. (Dr. Copley.) Second semester, Structure of Inorganic Molecules. (Dr. Bailar.) One, two, or three times a week; both semesters. *One-fourth to one unit.* Professor Hopkins.

Qualitative and Quantitative Analysis

123a. Qualitative Analysis.—The principles and methods of analytical chemistry; theory of solutions. Lectures. Twice a week; first semester. *One-half unit.* Associate Professor Reedy.

123c. Qualitative Analysis.—Laboratory work, optional, to accompany Chemistry 123a. One to three times a week; first semester. *One-fourth to three-fourths unit.* Associate Professor Reedy.

124b. Quantitative Analysis.—A modern survey of advanced principles, calculations, experimental methods and applications. Lectures. Twice a week; second semester. *One-half unit.* Associate Professor Reedy.

124d. Quantitative Analysis.—Laboratory work, optional, to accompany Chemistry 124b. One to three times a week; second semester. *One-fourth to three-fourths unit.* Assistant Professor Smith.

125a–125b. Quantitative Analysis.—(Seminar). Special topics in analytical chemistry. (Required of all students taking a major or minor in analytical chemistry.) One to three times a week; both semesters. *One-fourth to one unit.* Professor Clark.

126a. Quantitative Instrumental and Chemical Methods of Analysis in Chemical Research.—(Ultimate bomb analysis, gas density, polarimetry, refractometry, spectrophotometry, colorimetry, microscopy, etc.) Lectures. Twice a week; first semester. *One-half unit.* Assistant Professor Englis.

126c. Quantitative Instrumental and Chemical Methods of Analysis in Chemical Research.—Laboratory work, optional, to accompany Chemistry 126a. One to three times a week; first semester. *One-fourth to three-fourths unit.* Assistant Professor Englis.

127a–127b. Modern Applications of X-rays in Chemical and Industrial Problems.—Lectures. Twice a week; both semesters. *One-half unit.* Professor Clark.

127c–127d. Modern Applications of X-rays in Chemical and Industrial Problems.—Laboratory, optional, to accompany Chemistry 127a–127b. One to three times a week; both semesters. *One-fourth to one-half unit.* Professor Clark.

Organic Chemistry

132a. Organic Chemistry.—(First course.) Review of the general reactions in organic chemistry. Problems. Twice a week; first semester. *Three-fourths unit.* Professor Marvel.

133b. Organic Chemistry.—Optical isomerism; geometric isomerism; tautomerism, etc. Twice a week; second semester. *Three-fourths unit.* Professor Adams.

134. Organic Chemistry.—(Laboratory.) Advanced preparations are selected to meet the needs of each individual in the course. Two to four times a week; both semesters. *One-half to one unit.* Professors Marvel, Shriner.

135a–135b. Organic Chemistry.—(Seminar.) Current literature. (Required of all students majoring in organic chemistry.) Once a week; both semesters. *One-fourth unit.* Professor Adams.

136a. Organic Chemistry.—Special topics. Twice a week; first semester. *Three-fourths unit.* (Not given in 1935-36.) Professor Fuson.

Physical Chemistry

145a–145b. Physical Chemistry.—(Seminar.) Recent development in physical chemistry. Twice a week; both semesters. *Three-fourths unit.* Professor Rodebush and staff.

Physiological Chemistry

150b. Physiological Chemistry.—Chemistry of intermediary metabolism. Lectures; discussions; readings. Twice a week; second semester. *Three-fourths unit.* Professor Rose.

152a–152b. Physiological Chemistry.—Difficult biochemical preparations; chiefly laboratory. One to five times a week; both semesters. *One-half to one unit.* Professor Rose.

155a–155b. Physiological Chemistry.—(Seminar.) Current literature. (Required of all students majoring in physiological chemistry.) Twice a week; both semesters. *Three-fourths unit.* Professor Rose.

Chemical Engineering

160a-160b. Advanced Chemical Technology and Chemical Engineering.—Advanced work on unit operations and processes. Lectures. Twice a week; both semesters. *One-half unit.* Professor Keyes.

161a–161b. Chemical Plant Design.—Calculations and layout of equipment for recently developed processes. Twice a week; both semesters. *One-half unit.* Associate Professor Krase.

Sanitary Chemistry

186a-186b. Chemistry of Water Treatment.—Special problems and new developments in sanitary chemistry. Twice a week; both semesters. *One-half to one and one-fourth units.* Professor Buswell.

Miscellaneous

190a–190b. Research.—A thesis is usually required of students taking the master's degree and is always required of students taking the degree of Doctor of Philosophy. Both semesters. Work may be taken in the following subjects:

Physical and Electrochemistry.—Professor Rodebush, Associate Professor Phipps, Dr. Copley.

Inorganic Chemistry.—Professor Hopkins, Associate Professor Reedy, Drs. Audrieth, Bailar, Copley, Quill.

Analytical Chemistry.—Professor Clark, Associate Professor Reedy, Assistant Professors Englis, Smith.

Applied X-rays.—Professor Clark.

Food Chemistry.—Assistant Professor Englis.

Phyto-Chemistry.—Assistant Professor Englis.

Organic Chemistry.—Professors Adams, Marvel, Fuson, Shriner, Dr. Bailar.

Sanitary Chemistry.—Professor Buswell.

Zymo-Chemistry.—Professor Buswell.

Physiological Chemistry.—Professor Rose.

Chemical Engineering.—Professor Keyes, Associate Professor Krase, Assistant Professor Kistler.

Ceramic Chemistry.—Professor Parmelee.

Courses for Graduates and Advanced Undergraduates

Inorganic Chemistry

15a. Inorganic Chemistry.—The common elements; periodic relationship; preparation and application of the common elements and compounds. Lectures; recitations. Twice a week; first semester. Dr. Audrieth.

16a. Inorganic Chemistry.—(Laboratory.) Preparation of the less easily produced inorganic compounds. Twice a week; first semester. Dr. Bailar.

Qualitative and Quantitative Analysis

27. Special Methods and Instruments in Quantitative Analysis.—Three times a week; both semesters. Assistant Professor Smith.

29b. Food Analysis.—Quantitative organic analysis of food products; alcohols, carbohydrates, fats and oils, cereals, nitrogenous bodies, preservatives, and colors. Six times a week; second semester. Assistant Professor Englis.

Organic Chemistry

36b. Organic Chemistry.—(Second course.) Three times a week; second semester. Professor Marvel.

37b. Organic Chemistry.—(Laboratory.) (Second course.) Organic synthesis. To accompany Chemistry 36b. Twice a week; second semester. Professor Fuson.

38a. Qualitative Organic Analysis.—Identification of pure organic compounds and mixtures. Twice a week; first semester. Professor Shriner.

Physical Chemistry

40. Elementary Physical Chemistry.—Three times a week; both semesters. Professor Rodebush, Associate Professor Phipps.

41. Elementary Physical Chemistry.—(Laboratory.) To accompany Chemistry 40. Once a week; both semesters. Professor Rodebush, Associate Professor Phipps and assistants.

42. Elementary Physical Chemistry.—Three times a week; both semesters. Associate Professor Phipps.

43. Elementary Physical Chemistry.—(Laboratory.) Once a week; both semesters. Associate Professor Phipps and assistants.

44a–44b. Advanced Physical Chemistry.—Thermodynamics and free energy calculations. Atomic structure. Twice a week; both semesters. Professor Rodebush, Associate Professor Phipps.

49b. Chemistry of Colloids.—Lectures and demonstrations. Preparation and properties of colloids. Special apparatus and technique employed in colloid chemistry. Three times a week; second semester. Professor Buswell and assistant.

Physiological Chemistry

50a. Physiological Chemistry.—Proteins, fats, and carbohydrates; tissues, digestion, intestinal putrefaction, and feces; quantitative analysis of gastric contents, blood, milk, and urine. Lectures; laboratory. Five times a week; first semester. Professor Rose, Dr. Carter, and assistants.

51b. Problems of Metabolism.—Micro-methods of blood and urine analysis, and their application. Lectures; laboratory. Three times a week; second semester. Dr. Carter and assistants.

Chemical Engineering

60a. Chemical Technology.—The survey of important processes and recent developments in the chemical industry; optional inspection trip. (Estimated cost of this trip is $30 to $35 per student.) Laboratory. Four times a week; first semester. Assistant Professor Kistler.

61a.-61b. Principles of Chemical Engineering.—The application of scientific principles to the unit operations of chemical engineering. Lectures; laboratory. Four times a week; both semesters. Associate Professor Krase, Assistant Professor Kistler, Mr. Howard.

62a. Principles of Research and Development.—The fundamental methods used in research and development in chemical industry. Twice a week; first semester. Professor Keyes.

62b. Economics of Chemical Engineering.—Economic principles applied to chemical industry. Twice a week; second semester. Professor Keyes.

63b. Elements of Chemical Engineering.—Three times a week; second semester. Mr. Howard.

64b. High Pressure Reactions.—Processes and calculations. Twice a week; second semester. Associate Professor Krase.

65b. Chemical Engineering Calculations.—Three times a week; second semester. Assistant Professor Kistler.

71a. Sampling, Grinding, and Mixing.—Principles and calculations. Once a week; first semester. Mr. Howard.

73a. Metallurgy.—Manufacture of iron and steel. Three times a week; first semester. Mr. Howard.

74b. Metallurgy and Metallography.—General metallurgy of iron and steel; physical characteristics and microstructure of metals and alloys. Lectures; laboratory. Three times a week; second semester. Mr. Howard.

Sanitary Chemistry

86a. Chemistry of Water Treatment.—Lectures, demonstrations, field trips. Methods for determining water quality. Special water requirements of industries. Chemistry of water conditioning for municipal and industrial use. By-product recovery from industrial and other wastes. Three times a week; first semester. Professor Buswell.

Miscellaneous

92a. Chemical Literature and Reference Work.—Once a week; first semester. Dr. Bartow.

95a. History of Science with Particular Reference to Chemistry.—Lectures; reading. Twice a week; first semester. Dr. Bartow.

CIVIL ENGINEERING

The prerequisite for graduate work in civil engineering is the equivalent of the undergraduate course required for the degree of Bachelor of Science in

civil engineering in the branches of the subject in which registration is desired.

Courses open to junior and senior students are open for minor credit to students majoring in other departments.

See also Theoretical and Applied Mechanics and Railway Engineering.

Courses for Graduates

101. Water Supply.—Design, pumping machinery, administration, operation. Twice a week; first semester. *One unit.* Professor Babbitt.

102. Sewerage.—General sewerage design and construction, sewerage systems, hydraulics of sewers. Twice a week; second semester. *One unit.* Professor Babbitt.

103. Highway Engineering.—Highway transportation, airport design, street layouts, regional plans, and pavements for cities. Twice a week; first semester. *One unit.* Professor Crandell.

104. Municipal Engineering.—City finances and budgets, the work of the city manager and city engineer, zoning, play grounds and parks, street cleaning; smoke prevention, and fire prevention. Twice a week; second semester. *One unit.* Professor Crandell.

105. Reinforced Concrete Design.—Theories of action of beams, slabs and columns of reinforced concrete. Codes and specifications and their influence on design. Effect of continuity. Twice a week; first semester. *One unit.* Professors Cross, Shedd.

106. Structural Theory and Design.—General theory of continuity. Moment distribution. The column analogy. Rigid frame bridges and buildings. Fixed and continuous arches. Classification of structures from viewpoint of design. Twice a week; first semester. *One or two units.* Professor Cross.

107. Steel Design.—Design of steel members. Codes and specifications for buildings. Riveted and welded connections. Evolution of bridge specifications. Loads and working stresses. Economic proportions. Twice a week; second semester. *One unit.* Professors Cross, Shedd.

108. Structural Theory and Design.—Statically indeterminate trusses. Continuous trusses. Steel arches. Secondary stresses. Suspension bridges. Long span roofs. Skeleton steel buildings. Twice a week; second semester. *One or two units.* Professor Cross.

109. Water Purification and General Sanitation.—Design of water purification works and principles of sanitation. Twice a week; first semester. *One unit.* Professor Babbitt.

110. Sewage Disposal, Wastes Disposal, and General Sanitation.—Principles and design of sewage treatment and waste disposal works. Twice a week; second semester. *One unit.* Professor Babbitt.

112. Masonry Construction.—Design and construction of dams, retaining walls, abutments and piers, culverts, grain elevators, and bins. Twice a week; first semester. *One-half to one and one-half units.* Professor Huntington.

113. Foundations.—Investigation of sites, soil mechanics, spread footings, pile foundations, cofferdams, deep foundations. Once a week; second semester. *One-half to one unit.* Professor Huntington.

130. Hydrology.—Precipitation, evaporation, transpiration, run-off, stream flow regulation, flood control. Twice a week; first or second semester. *One unit.* Professor Pickels.

131. Water Power.—Preliminary investigations, selection of site, storage requirements, structures, machinery, etc. Twice a week; second semester. *One unit.* Professor Doland.

140. Special Problems.—Individual investigations of various phases of civil engineering. First or second semester. *One-half to two units.* Members of the department.

198. Thesis.—First or second semester. *One to two and one-half units.* Members of the department.

Courses for Graduates and Advanced Undergraduates

67-68. Statically Indeterminate Structures.—The elastic theory and its applications in statically indeterminate structures. Three times a week; both semesters. Professor Cross.

THE CLASSICS

The Degree of Master of Arts in the Classics.—The major may be either Latin or Greek.

The Degree of Doctor of Philosophy in the Classics.—The degree is given in classical philology. Major work may be taken in either Latin or Greek, but whichever language is taken as a major, the other must be taken as a first minor.

GREEK

Preparation for first-year graduate work in Greek must include at least two years of preparatory Greek, two years of college Greek, and two years of college Latin. A reading knowledge of French and German is important for candidates in this subject. The study of history and philosophy is especially recommended.

Courses for Graduates

106a. Greek Drama: Tragedy.—Twice a week; first semester. *One unit.* Associate Professor Perry.

121. Thucydides.—Twice a week; second semester. *One unit.* Associate Professor Perry.

110. Bibliography and Criticism.—(Thesis course; the same as Latin 110.) Once a week; both semesters. *One unit.* Professors Oldfather, Canter, Associate Professor Perry.

Courses for Graduates and Advanced Undergraduates

6. Thucydides and Plato.—Three times a week; first semester. Associate Professor Perry.

8. Greek Oratory: Aristotle and Theocritus.—Three times a week; second semester. Associate Professor Perry.

18. Greek Archaeology.—Twice a week; first semester. Dr. Rapp.

LATIN

Preparation for first-year graduate work in Latin must include at least two years of preparatory Latin and four years of college Latin. A reading knowledge of French and German is important. Some acquaintance with Greek is highly desirable, and the study of history and philosophy is especially recommended.

Courses for Graduates

104. Latin Palaeography.—Twice a week; first semester. *One unit.* Professor Oldfather.

109. Vergil.—Twice a week; first semester. *One unit.* Professor Canter.

110. Bibliography and Criticism.—(Thesis course; the same as Greek 110.) Once a week; both semesters. *One unit.* Professors Oldfather, Canter, Associate Professor Perry.

114. Caesar.—Twice a week; second semester. *One unit.* Professor Oldfather.

115. Latin Elegy.—Twice a week; second semester. *One unit.* Professor Canter.

Courses for Graduates and Advanced Undergraduates

18. Roman Archaeology.—Twice a week; second semester. Dr. Rapp.

21. Tacitus (*Annales*) and Juvenal.—Three times a week; first semester. Professor Canter.

22. Martial and Suetonius.—Three times a week; second semester. Professor Canter.

10. Composition.—Twice a week; second semester. Associate Professor Perry.

DAIRY HUSBANDRY

The graduate student may major in dairy husbandry for the degree of Master of Science or Doctor of Philosophy.

Candidates for advanced degrees in dairy husbandry must have had adequate training in collegiate courses in dairy husbandry. In addition, depending upon his field of specialization, the student should have had courses in the following subjects: chemistry, bacteriology, physics, economics, zoology, genetics, and mathematics.

For either degree a first minor must be taken outside the department, preferably outside the college. If a second minor is elected it may with proper approval be chosen in the department.

Courses for Graduates

101. Economic Milk Production.—Twice a week; both semesters. *One-half to two units.* Professor Fraser.

105. Dairy Manufactures.—Both semesters. *One-half to two units.* Professor Ruehe, Associate Professor Tracy.

106. Dairy Bacteriology.—Research on assigned problems. Both semesters. *One-half to two units.* Professor Prucha.

107. Dairy Chemistry.—Assigned problems. Both semesters. *One-half to two units.* Assistant Professor Overman.

108. Physiology of Lactation.—Both semesters. *One-half to two units.* Professor Gaines.

112. Research.—Graduate students writing theses should so indicate in registering in Dairy Husbandry 112. Both semesters. *One to four units.* Special problems along the following lines:

(a) Dairy Bacteriology.—Professor Prucha.

(b) Dairy Chemistry.—Assistant Professor Overman.

(c) Dairy Cattle Breeding.—Professor Yapp.

(d) Dairy Cattle Feeding.—Associate Professor Nevens.

(e) Milk Production.—Professor Gaines.

(f) Dairy Manufactures.—Professor Ruehe, Associate Professor Tracy.

113. Seminar.—Current literature in dairy bacteriology, dairy chemistry and dairy manufactures. Once a week; both semesters. *One-half unit.* Members of the Graduate Staff.

114. Seminar.—Current literature in biology of milk production. Once a week; both semesters. *One-half unit.* Professor Gaines.

Courses for Graduates and Advanced Undergraduates

4. Ice Cream Making.—Four times a week; first semester. Associate Professor Tracy.

5. Composition of Dairy Products.—Three times a week; second semester. Assistant Professor Overman.

7. Creamery Buttermaking and Factory Management.—Five times a week; second semester. Professor Ruehe, Mr. Tuckey.

8. Fluid Milk Plant Operations.—Three times a week; second semester. Associate Professor Tracy.

10. Advanced Dairy Bacteriology.—Three times a week; first semester. Professor Prucha, Assistant Professor Brannon.

14. Milk Condensing.—Three times a week; second semester. Associate Professor Tracy.

17. Advanced Study of Dairy Breeds.—Three times a week; first semester. Professor Yapp.

20. Economic Problems in Dairy Farming.—Three times a week; first semester. Professor Fraser.

21. Systems of Dairy Farming.—Three times a week; second semester. Professor Fraser.

25. Advanced Dairy Cattle Feeding.—Twice a week; first semester. Associate Professor Nevens.

ECONOMICS

Every student entering on major graduate work in economics must have had a course in the principles of the science and also in some special part of the field such as public finance or money and banking. The work must represent at least eight semester hours. He must have had at least one semester's work in English, American, or general European history, and at least three hours in political science.

Those who take the subject as a minor must have had a course of at least five semester hours in the principles alone, or in the principles and some other course for which this is a prerequisite.

Graduate students who are making economics their major are required during their first year to acquaint themselves with the works of the masters in the science, by taking either course 101 or 103. In the same or subsequent year they are expected to elect the fundamental courses in some other divisions of the field of economics. One of the minors for the doctor's degree may be taken in a separate division of economics; the other must be taken out of the department, and preferably outside of the College of Commerce.

The following courses may be taken by students in general economics for major or minor credit; all numbered above 100; 4, 10, 11, 24, 25, 29, 30, 31, 41, 42, 43, 44, 51, 52, 55, 61, 65, 71, 72, 81, 89, 92, 99. The following may be taken for minor credit only: 8, 9, 31, 36, 56, 82, 83, 93, 96.

Two units will be accepted for a first minor for the master's degree; and four two- or three-hour graduate courses, or their equivalent in advanced undergraduate courses, for a first minor for the doctor's degree.

Courses in agricultural economics, accountancy, and business organization and operation may be used to satisfy the requirements for the minor. See Business Organization and Operation, and Agricultural Economics.

Courses for Graduates

101. Economic Theory.—Twice a week; both semesters. *One unit.* Professor Fetter.

102. Theory and History of Money, Credit, and Prices.—Twice a week; both semesters. *One unit.* Dr. Lounsbury.

103. The Distribution of Wealth.—Twice a week; both semesters. *One unit.*

104a. Theories and Policies of International Trade.—Twice a week; first semester. *One unit.* Professor Litman.

104b. Organization of International Trade.—Twice a week; second semester. *One unit.* Professor Litman.

105. Public Finance.—Twice a week; both semesters. *One unit.* Professor Hunter.

106. International Exchange and the Money Markets.—Twice a week; second semester. *One unit.* Associate Professor Wright.

107. The Corporation in Economic Evolution.—Twice a week; both semesters. *One unit.* Assistant Professor Wasserman.

109. Comparison of the Theory and Practice of the Leading Central and Reserve Banks with Special Reference to England, Germany, France, and the United States.—Twice a week; first semester. *One unit.* Associate Professor Wright.

110a. Finance and Investments: Fundamental Principles Applied to Business Units of a Simple Character.—Twice a week; both semesters. *One unit.* Assistant Professor Brown.

112. Labor Problems.—Twice a week; both semesters. *One unit.* Associate Professor Berman.

This course is arranged in a two-year cycle:

1935-36: Wages and Unemployment, first semester; Labor and the Law, second semester.

1936-37: Labor Problems; Trade Unionism; both semesters.

118. Seminar.—Thesis course. (All graduate students writing theses in economics must register in Economics 118; registration for other students is optional.)

(a) Third Year: Seminar.—Professor Litman.
(b) First Year: General Economics.—Assistant Professor Brown.
(d) First Year: Public Utilities.—Assistant Professor Gray.

120. History of Economic Thought.—Twice a week; both semesters. *One unit.* Professor Fetter.

122. Economic History of the United States.—Twice a week; both semesters. *One unit.* Professor Bogart.

123. Industrial and Financial Organization of Society.—Twice a week; both semesters. *One unit.* Professor Lee.

124. International Economics and Finance.—Twice a week; both semesters. *One unit.* (Not given in 1935-36.) Professor Bogart.

143. The Administration of Industrial Relations.—Twice a week; both semesters. *One unit.* Dr. Helbing.

144. Business Cycles.—Twice a week; both semesters. *One unit.* Assistant Professor Dickinson.

180. Management of Public Utilities.—Twice a week; both semesters. *One unit.* Assistant Professor Gray.

192. Economics of Transportation.—Twice a week; both semesters. *One unit.* Assistant Professor Locklin.

See also Mathematics 129.—Theory of Statistics.

Courses for Graduates and Advanced Undergraduates

4. History of Money and Banking Institutions, with Particular Reference to the United States.—Three times a week; second semester. Professor Lee.

8. Foreign Exchange and the Money Market.—Three times a week; second semester. Associate Professor Wright.

9. Advanced Theory and Practice of Banking.—Three times a week; first semester. Associate Professor Wright.

10. Corporation Finance and Management.—Three times a week; either semester. Assistant Professor Gray and others.

11. Industrial Consolidation. — Development; plans for controlling trusts. Three times a week; first semester. Assistant Professor Brown.

23. Economic Problems.—Three times a week; first semester. Professor Lee.

24. Economic Development of Modern Europe.—Three times a week; second semester. Professor Bogart.

25. Economic History of England.—Three times a week; first semester. Professor Bogart.

28. Ocean Shipping.—Three times a week; first semester. (Not given in 1935-36.) Professor Litman.

29. International Commerce and Commercial Policies.—Three times a week; second semester. Professor Litman.

30. World Markets.—Three times a week; second semester. Professor Litman.

31. Organization of International Commerce.—Three times a week; first semester. Professor Litman.

36. Investments.—Three times a week; second semester. Assistant Professor Brown.

41. Labor Problems.—Three times a week; first semester. Associate Professor Berman.

42. Trade Unionism.—Three times a week; second semester. Associate Professor Berman.

43. Personnel Administration.—Three times a week; second semester. Dr. Helbing.

44. Socialism and Economic Reform.—Three times a week; either semester. Dr. Helbing.

51. Public Finance.—Three times a week; either semester. Professor Hunter.

52. Problems in Taxation, with Special Reference to Illinois.—Three times a week; second semester. Professor Hunter.

55. Economics of Insurance (Life).—Three times a week; first semester. Assistant Professor Dickinson.

56. Economics of Insurance (Property).—Three times a week; second semester. Assistant Professor Dickinson.

58. Urban Land Economics.—Three times a week; first semester. (Not given in 1935-36.) Assistant Professor Dickinson.

61. Economic Theory.—Three times a week; both semesters. Associate Professor Berman.

71. Economic Statistics.—Three times a week; first semester. Assistant Professor Dickinson.

72. Economic Statistics (Business Barometers).—Three times a week; second semester. Assistant Professor Dickinson.

81. Principles of Public Utilities.—Three times a week; first semester. Assistant Professor Gray.

82. Regulation of Public Utilities.—Twice a week; second semester. Associate Professor Dillavou.

83. Public Utility Rates.—Three times a week; second semester. Assistant Professor Gray.

93. Industrial Traffic Management.—Three times a week; second semester. Assistant Professor Locklin.

94. Railroad Operation.—Three times a week; second semester. (Not given in 1935-36.)

95. Railroad Rates.—Three times a week; first semester. Assistant Professor Locklin.

96. Transportation Problems.—Three times a week; second semester. Assistant Professor Locklin.

97. Railroad Finance.—Three times a week; second semester. Assistant Professor Locklin.

98. Railroad Organization.—Twice a week; first semester. (Not given in 1935-36.)

EDUCATION

In addition to complying with the general rules of the Graduate School, candidates for the master's degree in education must meet the following requirements; (1) Education 125 is a required course for all students; (2) for students who have not taken a course in the history of education, Education 11 or Education 30 is required; (3) Education 6 and 25, or their equivalents, are prerequisites for all graduate courses.

No student is recommended to the Dean of the Graduate School for formal admission to candidacy for the master's degree until at least four units of the eight ordinarily required for the degree have been completed satisfactorily. In the case of a student who has been allowed to waive the thesis (see page 13) two papers will be required. The first shall be written during the first half of the student's residence and shall be an important factor in determining his further status in the department. The second shall be written during the second half of the student's period of residence.

Courses for Graduates

101. Philosophy of Education.—Twice a week; second semester. *One unit.* Professor Cameron.

102. Research in History of American Education.—Once a week; two hours; both semesters. *One unit.* Professor Seybolt.

104. Educational Administration.—Twice a week; both semesters. *One unit.* Associate Professor Weber.

106. High School Administration.—Once a week; two hours; first semester. *One unit.* Professor Clement.

120a. Supervision of Secondary Education.—Once a week; two hours; second semester. *One unit.* Professor Clement.

121. Educational Measurement.—Once a week; two hours; second semester. *One unit.* Associate Professor Odell.

123. Educational Statistics.—Once a week; two hours; first semester. *One unit.* Associate Professor Odell.

124. Readings in Educational Research.—Once a week; two hours; both semesters. *One unit.* Professor Monroe.

125. Educational Psychology.—Once a week; two hours; both semesters. *One unit.* Professor Cameron.

127. High-School Curricula.—Once a week; two hours; first semester. *One unit.* Professor Clement.

128. Junior High School.—Twice a week; first semester. *One unit.* Professor Clement.

129. The Junior College.—Once a week; two hours; second semester. *One unit.* Professor Clement.

131. Analysis and Evaluation of High School Texts.—Once a week; two hours; second semester. *One unit.* Professor Clement.

147. Psychology of Elementary School Subjects.—Once a week; two hours; first semester. *One unit.* Professor Cameron.

148. Psychology of High School Subjects.—Once a week; second semester. *One unit.* Professor Cameron.

150. Thesis.—Both semesters. *One or two units.* Dean Benner and others.

170. Public School Finance and Business Administration.—Once a week; two hours; second semester. *One unit.* Associate Professor Weber.

184. Seminar in School Administration.—Once a week; two hours; second semester. *One unit.* Associate Professor Weber.

185. Seminar in Educational Psychology.—Once a week; two hours; both semesters. *One unit.* Professor Cameron, Associate Professor Griffith.

187. Seminar in Industrial Education and Guidance.—Once a week; two hours; first semester. *One unit.* Professor Mays.

190. Seminar in Educational Research.—Once a week; two hours; second semester. *One unit.* Dean Benner and others.

Courses for Graduates and Advanced Undergraduates

11. Ancient and Medieval Education.—Twice a week; first semester. Professor Seybolt.

15. Mental Hygiene in the School.—Three times a week; first semester. Associate Professor Griffith.

18. Educational Measurements.—Three times a week; both semesters. Associate Professor Odell.

21. Supervision of Elementary Education.—Three times a week; first semester. Dr. Browne.

30. History of American Education.—Twice a week; second semester. Professor Seybolt.

40. Trends in Elementary Education.—Three times a week; first semester. Assistant Professor Dolch.

41. Vocational Education.—Three times a week; both semesters. Professor Mays.

42. Special Education.—Twice a week; first semester. (Not given in 1935-36.) Assistant Professor Dolch.

43. Mental Tests.—Three times a week; second semester. Assistant Professor Potthoff.

45. Genetic Psychology for Teachers.—Three times a week; both semesters. Associate Professor Griffith.

50. Psychology of the Pre-School Child.—Three times a week; second semester. Associate Professor Griffith.

52. Function, Organization, and Methods of the Evening School.—Twice a week; second semester. Professor Mays.

53. Problems of Industrial Education.—Three times a week; both semesters. Professor Mays.

55. Problems of Vocational Guidance.—Three times a week; second semester. Professor Mays.

ELECTRICAL ENGINEERING

The prerequisite for graduate work in electrical engineering is the equivalent of the undergraduate courses required for the degree of Bachelor of Science in electrical engineering in the branches of the subject in which registration is desired.

Graduate students who wish to take a minor in electrical engineering must have had differential and integral calculus, and one year's work in college physics.

Courses offered to junior and senior students in electrical engineering are open for minor credit to students majoring in other departments who have the proper prerequisites.

Courses for Graduates

101. Advanced Courses in Alternating Currents.—Both semesters. *One-half to two units:*
   (a) Graduate Seminar.—Professor Paine.
   (b) Circuit Transients.—Professor Knight.
   (c) Machine Transients.—Assistant Professor Keener.
   (d) Symmetrical Components.—Assistant Professor Kraehenbuehl.

102. Electric Waves, Oscillations, and Transients.—Both semesters. *One-half to two units:*
   (a) Theory of Electric Waves, Oscillations, and Transients.—Assistant Professor Reich.
   (b) Demonstration Lectures.—Assistant Professor Reich.
   (c) Theory of Energy Radiation.—Assistant Professor Brown.
   (d) Principles of Television Engineering.—Assistant Professor Brown.

103. Electrical Design.—Both semesters. *One unit:*
   (a) Power Plant Design.—Professor Paine.
   (b) Machine Design.—Professor Paine.
   (c) Illumination Practice and Design.—Assistant Professor Kraehenbuehl.

104. Vacuum Tubes and Electronic Control.—Both semesters. *One unit:*
   (a) Theoretical Electronics.—Assistant Professor Reich.
   (b) Vacuum Tubes and Amplifiers.—Assistant Professor Reich.
   (c) Photoelectric Cells, Gaseous Control Tubes, and Inverters.—Assistant Professor Reich.

105. Electrical Engineering Research.—Both semesters. *One to three units.* Professors Paine, Tykociner, Knight; Assistant Professors Brown, Reich, Keener, Kraehenbuehl.

ENGLISH LANGUAGE AND LITERATURE

Students who enter on graduate work with English as their major subject are required to give evidence of their ability to write good English. They must present the equivalent of fourteen hours of undergraduate work in English literature, the required college work in rhetoric, and the equivalent of four semesters of college work in Latin, or in Greek, or in French, or in German. After the first year of graduate work a knowledge of French and German is indispensable.

Students making English their minor may be admitted to such courses as in the judgment of the instructor in charge they are qualified to pursue.

The Degree of Master of Arts in English.—In addition to complying with the general rules of the Graduate School, candidates for the degree of Master of Arts in English must comply with the following rules of the Department of English: (1) They must choose a portion of their work from the group of courses described as "for graduates"; (2) must offer an elementary course in Anglo-Saxon; and (3) must pass a general examination.

The Degree of Doctor of Philosophy in English.—Candidates for the degree of Doctor of Philosophy in English may expect to be examined on the entire field of the English language and literature. They are urged, furthermore, to acquaint themselves as fully as possible with the history and philosophy of the period in which their main interest lies, and with the foreign languages and literature most closely related to English and that period.

Courses for Graduates

101. Research in Special Topics. — *One to two units.* Professors Graham, Bernbaum, Flom, Paul, Zeitlin, E. C. Baldwin, T. W. Baldwin, Jones, Hillebrand, Jefferson; Associate Professors Parry, Fletcher; Assistant Professors Rinaker, Secord, Finney.

110. Old English (Anglo-Saxon) Poetry.—Twice a week; first semester. *One unit.* Professor Flom.

114. The Development of the Essay.—The English essay; classical origins; continental influences. Twice a week; both semesters. *One unit.* (Not given in 1935-36.) Professor Zeitlin.

128. Literature of the Sixteenth Century.—Twice a week; both semesters. *One unit.* Professor Jones.

129. English Literature from the Norman Conquest to 1400.—Twice a week; both semesters. *One unit.* (Not given in 1935-36.) Professor Jones.

130. Tragedy.—Twice a week; both semesters. *One unit.* Professor Hillebrand.

135. Problems in American Literature.—Twice a week; both semesters. *One unit.* Professor Paul.

137. Prose Writers of the Nineteenth Century.—Twice a week; both semesters. *One unit.* Professor Zeitlin.

138. The Romantic Movement.—Twice a week; both semesters. *One unit.* (To receive credit, a student must take both semesters.) Professor Bernbaum.

140. Investigations in Modern English Literature.—(For second-year and third-year graduate students who are preparing theses for the doctor's degree.) Once a week; three hours; both semesters. *One to three units.* (May be taken in successive years.) Professor Bernbaum.

141. Literature of the Seventeenth Century.—Twice a week; both semesters. *One unit.* Professor E. C. Baldwin.

143. History and Theory of Prose Fiction.—Once a week; two hours; both semesters. *One unit.* (To receive credit, a student must take both semesters.) Professor Bernbaum.

145. English Literature in the Eighteenth Century.—Twice a week; both semesters. *One unit.* Professor Graham.

147. Shakespeare and Elizabethan Drama.—Critical study of the chief plays. Twice a week; both semesters. *One unit.* Professor T. W. Baldwin.

149. Development of Tudor Drama.—Twice a week; both semesters. *One unit.* Professor T. W. Baldwin.

151. Seminar in the Literature of the Augustan Age.— Twice a week; second semester. *One unit.* Professor Graham.

157. Seminar in Spenser.—Twice a week; first semester. *One unit.* Professor Jones.

Courses for Graduates and Advanced Undergraduates

3. Poetry of Milton.—Three times a week; second semester. Professor E. C. Baldwin.

5. Shakespeare.—Three times a week; second semester. Professor T. W. Baldwin.

8. Old English (Anglo-Saxon).—Three times a week; first semester. Professor Flom.

9. Beowulf.—Three times a week; second semester. Professor Jones.

17. History of the English Language.—Three times a week; second semester. Professor Flom.

25. Chaucer.—Three times a week; first semester. Professor Jones.

26. Spenser.—Three times a week; second semester. Professor Jones.

29. English Literature from 1557 to 1688 (Exclusive of the Drama).—Three times a week; first semester. Professor E. C. Baldwin.

33. English Literature from 1789 to 1837.—Three times a week; first semester. Professor Zeitlin.

34. Dr. Johnson and His Circle.—Three times a week; first semester. Assistant Professor Rinaker.

35. The English Drama (Previous to Shakespeare).—Three times a week; first semester. Professor T. W. Baldwin.

36. The English Drama (Exclusive of Shakespeare) from 1600 to 1700.—Three times a week; second semester. Professor Hillebrand.

38. The Arthurian Tradition.—Three times a week; second semester. Associate Professor Parry.

39. Introduction to Medieval Literature.—Three times a week; first semester. Associate Professor Parry.

43. Browning.—Three times a week; second semester. Professor Graham.

50. Prose of the First Half of the Seventeenth Century.—Three times a week; second semester. Professor Zeitlin.

51. Great Novelists of the Eighteenth Century.—Three times a week; second semester. Assistant Professor Secord.

54a–54b. Introduction to Comparative Literature.—Three times a week; both semesters. Professors Bernbaum, Aron, Carnahan, Oldfather, Van Horne; Associate Professors Parry, Hamilton, Landis; Dr. Busey.

55a–55b. Survey of English Literature.—Three times a week; both semesters. Associate Professor Parry, Assistant Professor Finney.

57. Great Foreign Novelists in Relation to the English Novel.—Goethe, Hugo, Manzoni, Balzac, Dumas, Flaubert, Zola, Turgenev, Dostoevski, Tolstoi. Three times a week; first semester. Professor Bernbaum.

SCANDINAVIAN LANGUAGES

Preparation for major graduate work in the Scandinavian languages or literature must include a good knowledge of one of the Scandinavian languages and systematic work in the undergraduate courses in Scandinavian. Any graduate student in language may, however, be admitted to the purely philological courses.

Courses for Graduates

101. Old Norse.—Introduction to the language; grammar; reading of the Prose Edda in part, and selections from the sagas. Twice a week; both semesters. *One unit.* Professor Flom.

150. Research.—Special problems in Scandinavian philology or literature. Thesis. Once a week; both semesters. *One-half to two units.* Professor Flom.

ENTOMOLOGY

The prerequisite for graduate work in entomology is two years of undergraduate biology, including zoology and entomology. Entrance on major work in entomology requires at least six hours of entomology. A reading knowledge of French and German is desirable by the beginning of the second year.

Courses for Graduates

100. Research.—Once or twice a week; both semesters. *One-half to four units.*

(a) Morphology and Embryology of Insects. Associate Professor Hayes.

(b) Economic Entomology. Professor Metcalf.

(c) Systematic Entomology. Professor Metcalf, Assistant Professor Balduf.

(d) Biology and Ecology of Insects. Professor Metcalf.

107. Insect Anatomy.—Lectures and laboratory. Three times a week; both semesters. *One unit.* (Given in alternate years; not given in 1935-36.) Associate Professor Hayes.

Courses for Graduates and Advanced Undergraduates

6. Special Problems.—Once or twice a week; both semesters. Various instructors.

8c. Pests of Man and Domestic Animals.—Lectures and laboratory. Three times a week; second semester. (Given in 1935-36 and in alternate years.) Professor Metcalf.

10. Morphology and Taxonomy of Immature Insects.—Lectures and laboratory. Three times a week; both semesters. (Given in 1935-36 and in alternate years.) Associate Professor Hayes.

20. Insect Control.—Lectures and laboratory. Three times a week; first semester. Professor Metcalf.

21. Insect Bionomics.—Lectures and readings. Three times a week; second semester. Professor Metcalf.

GENETICS

Those desiring a general training in genetics may take a major or minor in botany or zoology. Those desiring to approach agricultural problems through

genetics may take a major or minor in agronomy, horticulture, or animal husbandry. For courses in the subject see departments of Agronomy, Animal Husbandry, Botany, Horticulture, and Zoology.

GEOLOGY AND GEOGRAPHY

For graduate work in geology the student must usually have had at least a major in geology and an acceptable field training. The following undergraduate courses are recommended: Geology 2, 20, 9, 16, 15, 24, and 49. Graduate students in other departments may nevertheless be admitted to certain graduate courses in geology.

For graduate work in geography the student must have had at least the equivalent of a major in geography.

A. GEOLOGY

Courses for Graduates

102. Igneous Petrography.—Lectures; laboratory. Twice a week; both semesters. *One unit.* Professor Quirke.

122. Mountain and Continental Structures.—A study of the structure and dynamics of mountain ranges and of other areas having interesting structural problems. Three times a week; second semester. *One unit.* (Given in 1935-36 and in alternate years.) Assistant Professor Shepard.

125. Sedimentation.—The interpretation of sedimentary rocks in terms of their origin. Twice a week; first semester. *One unit.* (Given in alternate years; not given in 1935-36.) Assistant Professor Wanless.

134. Advanced Studies in Geology.—Studies in petrography, crystallography, metamorphism, pre-Cambrian geology, ore deposition, advanced paleontology, micropaleontology, geophysical prospecting, and other subjects, to be arranged with members of the department. *One-half to four units.*

135. Research.—Once a week; both semesters. *One-half to four units.* Members of the department.

142. Paleozoic Stratigraphic Paleontology.—The invertebrate index fossils of the successive geologic formations. Three times a week; first semester. *One unit.* Assistant Professor Sutton.

143. Post-Paleozoic Stratigraphic Paleontology.—Stratigraphic study of the formations with a consideration of characteristic fossils. Three times a week; second semester. *One unit.* Assistant Professor Sutton.

151. Advanced Dynamic Geology.—A critical analysis of geologic processes and their results; the materials and structure of the earth; problems of geologic interpretations. Three times a week; first semester. *One unit.* (Given in alternate years; not given in 1935-36.) Assistant Professor Shepard.

152. Advanced Historical Geology.—Cosmogeny; the record of diastrophism; the development of the continents and oceans; the relationship between oceanic fluctuations and organic differentiation and evolution; physiographic, climatic, and organic history. Three times a week; first semester. *One unit.* (Given in 1935-36 and in alternate years.) Assistant Professor Sutton.

160. Petroleum Geology.—Twice a week; both semesters. *One unit.* (Given in alternate years; not given in 1935-36.) Associate Professor Howard.

163. Geologic Development of the Continents.—The paleography of continents other than North America, together with an outline of the geology of these continents as described in foreign geological literature. Three times a week; both semesters. *One unit.* (Given in 1935-36 and in alternate years.) Associate Professor Howard.

Courses for Graduates and Advanced Undergraduates

9. Invertebrate Paleontology.—Fossil groups in biological sequence. Three times a week; first semester. Assistant Professor Sutton.

15. Structural Geology.—Rock deformation and its results. Three times a week; first semester. (Given in 1935-36 and in alternate years.) Assistant Professor Shepard.

16. Stratigraphy.—Fossil faunas, with special reference to Paleozoic invertebrates, correlation, and stratigraphy. Three times a week; second semester. Assistant Professor Sutton.

24. Field Methods and Mapping.—Once a week and three or four one-day field trips and one longer field trip. (Given in 1935-36 and in alternate years.) Assistant Professor Wanless.

38. Regional Geology of the United States.—The characteristics of individual geologic provinces. Three times a week; first semester. (Given in 1935-36 and in alternate years.) Associate Professor Howard.

49. Microscopic Mineralogy.—Five times a week; second semester. Professor Quirke.

60a–60b. Introduction to Research.—Two or four times a week; both semesters. Members of the department.

61a-61b. Applied Petroleum Geology.—Three times a week; both semesters. Associate Professor Howard.

95. Economic Geology.—The nature, occurrence, origin, and uses of coal, oil, building stones, and bedded deposits of economic importance. Three times a week; first semester. (Given in 1935-36 and in alternate years.) Professor DeWolf.

96. Economic Geology.—The nature, occurrence, and origin of metalliferous deposits; theories of ore deposition. Three times a week; second semester. (Given in 1935-36 and in alternate years.) Professor Quirke.

B. GEOGRAPHY

Courses for Graduates

134. Advanced Studies in Geography.—Studies in geographical subjects. *One-half to four units.* Professor Blanchard, Assistant Professor Page.

135. Research.—Once a week; both semesters. *One-half to four units.* Professor Blanchard, Assistant Professor Page.

Courses for Graduates and Advanced Undergraduates

8. Geography of Europe.—Three times a week; first semester. Professor Blanchard.

10. Geography of Africa.—Three times a week; second semester. (Given in 1935-36 and in alternate years.) Assistant Professor Page.

11. Geography of Asia.—Three times a week; second semester. Dr. Poggi.

14a. Climate of the Continents.—Three times a week; second semester. (Given in alternate years; not given in 1935-36.) Assistant Professor Page.

53a. Production of the Great World Staples.—Three times a week; first semester. Professor Blanchard.

53b. Geographical Aspects of World Transportation.—Three times a week; second semester. Professor Blanchard.

60a–60b. Introduction to Research.—Two or four times a week; both semesters. Members of the department.

GERMAN

Students desiring to take German as a major are required to have finished successfully a four-year course of undergraduate work in German, or its equivalent. They are also required to be familiar with the principal works of the writers of the classical and modern periods of German literature, to show a general knowledge of the history of German literature, and to be able to follow lectures in the German language.

Of collateral subjects, a reading knowledge of French is important and is required for advanced graduate work. Some acquaintance with Latin and with German history is highly desirable.

Courses for Graduates

101. Seminar in Goethe and Schiller.—Twice a week; both semesters. *One unit.* Professor Aron.

Note.—Course 101 is arranged in a three-year rotation: Seminar in Modern German Drama, 1936-37; and Seminar in the German Novel, 1937-38. Course S101 is arranged in a two-year rotation: Seminar in Volkskunde with Special Reference to the Volkslied, Summer of 1935, Associate Professor Williams; and Seminar in the German Lyric, Summer of 1936, Professor Aron.

102. Thesis.—Both semesters. *One-half to two units.* Professors Aron, Brooks; Associate Professor Williams; Assistant Professor Geissendoerfer.

104. Gothic.—Grammar and literature. Twice a week; first semester. *One unit.* Associate Professor Williams.

105. Old High German.—Grammar and interpretation of the oldest literary documents. Twice a week; second semester. *One unit.* Associate Professor Williams.

110. Early German Drama.—German drama up to the Reformation. Twice a week; second semester. *One unit.* (Alternates with course 32.) Professor Brooks.

113. German Literature of the Fifteenth and Sixteenth Centuries.—Twice a week; first semester. *One unit.* Professor Brooks.

117. German Literature of the Seventeenth and Eighteenth Centuries.—Twice a week; both semesters. *One unit.* (Given in alternate years; not given in 1935-36.) Professor Aron.

121. Walther von der Vogelweide.—Twice a week; second semester. *One unit.* (Alternates with course 121a.) Associate Professor Williams.

121a. The Nibelungenlied.—Twice a week; second semester. *One unit.* (Alternates with course 121; not given in 1935-36.) Associate Professor Williams.

Courses for Graduates and Advanced Undergraduates

19a–19b. Goethe's Faust.—The Faust legend and early Faust books and plays; the genesis of Goethe's *Faust;* reading of both parts. Twice a week; both semesters. Professor Brooks.

26a. German Literature up to 1800.—Three times a week; first semester. Professor Aron.

26b. German Literature since 1800.—Three times a week; second semester. Professor Aron.

31. Middle High German.—Twice a week; first semester. Associate Professor Williams.

32. History of German Civilization.—Three times a week; second semester. (Alternates with course 110; not given in 1935-36.) Professor Brooks.

HISTORY

Graduate work in history requires two years of college work in this subject, or sixteen semester hours, which should ordinarily include introductory courses in European and American history. Linguistic preparation is important, especially in French and German. For medieval history some knowledge of Latin is essential and Spanish is useful for certain fields of American history.

Advanced courses in history at the University of Illinois are of three kinds: (1) Courses for information and guidance in general reading. (2) Instruction in methodology, historiography, and bibliography. A part of this work (in course 103) is required of all graduate students in history during their first year. (3) Seminar courses for the study of special fields with a view primarily to training in the methods of historical criticism and research.

Illinois Historical Survey.—Students of history have an opportunity to pursue research in western history in connection with the Illinois Historical Survey, which is an organization for the purpose of carrying on systematic studies in the history of Illinois.

Attention is also called to the fact that the University of Illinois has for some time coöperated with the Trustees of the State Historical Library in the gathering and editing of archive material. As a result of this relation instructors and graduate students in the department have contributed from time to time to the publications of the Library and have been given useful training in the study of manuscript as well as of printed material.

Higher Degrees in History.—The following statement regarding the specific requirements for higher degrees in history is subject to the general requirements of the Graduate School.

Master of Arts

In addition to meeting the usual tests in the specific courses taken, each candidate for this degree will ordinarily be required to pass a general written examination early in the year and toward the close of the second semester an examination, also written, in two of the following fields: ancient history; medieval history of continental Europe; modern history of continental Europe; English history; American history; Latin-American history. The candidates are expected to have a general knowledge of historical method (see course 103). The department further requires a working knowledge of one important foreign language, ordinarily French or German.

Doctor of Philosophy

Major Requirements.—A candidate who selects history as his major subject may offer himself for examination in any four of the fields indicated below, stating also the particular field among these four in which he wishes to specialize and in which his thesis is to be written:

1. Ancient history. 2. Medieval history and institutions of continental Europe, to the close of the thirteenth century. 3. Continental Europe from 1300 to 1648. 4. Continental Europe and its dependencies since 1648 (except as included in 5 and 6). 5. The history of England and its dependencies (not including America before 1783). 6. The history of the United States. 7. The history of Latin America. This enumeration of fields is not to be regarded as excluding the possibility of accepting others as may be determined by the department in individual cases.

Minor Subjects.—A candidate for the doctorate in history may select as his first minor one of the divisions of the field of history listed above which is not offered as a part of his major. He should preferably, however, select his minors from subjects offered by other departments. The following list of suitable minors is intended to be suggestive rather than exhaustive or compulsory.

Political Science.—(Any two acceptable for a first minor; any one, for a second minor.) 1. International law and diplomacy. 2. Modern government. 3. Municipal government. 4. Constitutional and administrative law and jurisprudence. 5. Political theory.

Economics and Sociology.—(Any two acceptable for a first minor; any one, for a second minor.) 1. Economic history. 2. Economic theory. 3. Public and private finance. 4. Social reform. 5. Principles of sociology.

Philosophy and Education.—(Any two acceptable for a first minor; any one, for a second minor.) 1. History of ancient and medieval philosophy. 2. History of modern philosophy. 3. History of education.

Literature.—Some division of the history of literature which may be either comparative literature of a limited period or the literature of a particular country for a more extended period as may be agreed upon in each case.

Courses for Graduates

101. Seminar in American History.—Once a week; two hours; both semesters. *One unit.* Semester I: Introduction to research in American history. Professor Robertson. Semester II: Guidance in the investigation of selected topics. Professor Randall.

102. Seminar in English History.—A study of selected topics in the early modern period. Arrange hours; both semesters. *One unit.* Professor Dietz.

103. Historiography and Historical Method.—Required of all candidates for an advanced degree in history who do not present evidence of similar training elsewhere. Twice a week; first semester. *One unit.* Professor Randall.

104. Seminar in European History.—Once a week; two hours; both semesters. *One unit.* Professor Lybyer.

105. Research in Special Topics.—Guidance in writing theses for advanced degrees. *One to two units.* Professors Larson, Lybyer, Robertson, Pease, Jones, Randall, Dietz, Hansen; Associate Professors Swain, Rodkey; Assistant Professors Dunbar, Ronalds, Werner.

106. Seminar in the History of the Later Middle Ages.—Arrange hours; both semesters. *One unit.* Professor Larson.

122. History of the West.—An intensive study of the westward movement, 1748-1778. Twice a week; both semesters. *One unit.* Professor Pease.

126. Spain in Europe and America, 1750-1870.—Bibliography, historiography, and topical reports. Arrange hours; first semester. *One unit.* Professor Robertson.

127. Inter-American Relations.—Relations of the Latin-American nations with each other and with the United States. The Monroe Doctrine, intervention, etc. Arrange hours; second semester. *One unit.* Professor Robertson.

133. Studies in the History of Europe in the Nineteenth Century.—Once a week; two hours; both semesters. *One unit.* (Not given first semester of 1935-36.) Associate Professor Rodkey.

138. History of France in the Sixteenth and Seventeenth Centuries.—Twice a week; both semesters. *One unit.* Professor Jones.

150. Seminar in Ancient History.—Problems in the relations of East and West. Arrange hours; both semesters. *One unit.* Associate Professor Swain.

Courses for Graduates and Advanced Undergraduates

16a–16b. The American Colonies in the Eighteenth Century and the Beginnings of National Life and Organization.—Three times a week; both semesters. Assistant Professor Dunbar.

17a–17b. Social and Economic Forces in the United States in the Nineteenth Century.—Three times a week; both semesters. Professor Hansen.

19a–19b. History of American Immigration.—Twice a week; both semesters. Professor Hansen.

20a–20b. History of the South.—Twice a week; both semesters. Professor Randall.

21. History of the United States since 1877.—Twice a week; first semester. Professor Robertson.

22a.–22b. History of the West, 1634-1830.—Twice a week; both semesters. Professor Pease.

25. The Civil War and the Reconstruction.—Three times a week; first semester. Professor Randall.

26. History of the Latin-American Colonies.—Three times a week; first semester. Professor Robertson.

27. History of Latin America from the Wars of Independence to the Present Time.—Three times a week; second semester. Professor Robertson.

29. America and Europe, 1776-1870.—Foundations of international intercourse, with particular reference to the Latin-American colonies and states. Three times a week; second semester. Professor Robertson.

32a–32b. History of Europe, since 1878.—Three times a week; both semesters. Professor Lybyer.

36a-36b. History of the German People in Modern Times.—Three times a week; both semesters. (Not given first semester of 1935-36.) Associate Professor Rodkey.

38a–38b. Development of the French Monarchy in the Later Middle Ages and in Early Modern Times, 1285-1648.—Three times a week; both semesters. (Not given in 1935-36.) Professor Jones.

39a–39b. The Renaissance and the Protestant and Catholic Reformations.—The transition from medieval to modern ideals. Three times a week; both semesters. Professor Jones.

44a–44b. Constitutional History of England.—Three times a week; both semesters. Professor Larson.

46a-46b. Social and Economic History of England, 1750-1935.—Three times a week; both semesters. (Not given in 1935-36.) Professor Dietz.

47a–47b. History of England in the Later Middle Ages and in the Early Modern Period, 1399-1603.—Three times a week; both semesters. Professor Dietz.

55. History of the Ancient Greek States.—Three times a week; first semester. Professor Oldfather.

56. History of the Roman Republic.—Three times a week; second semester. Professor Oldfather.

57a–57b. Ancient Imperialism, Hellenistic and Roman.—Three times a week; both semesters. Associate Professor Swain.

60. The United States in the World War.—Three times a week; second semester. Professor Randall.

62a–62b. Political and Constitutional Development of the United States.—Three times a week; both semesters. Professor Randall.

HOME ECONOMICS

As preparation for graduate work with a major in foods and nutrition the student must have had at least the equivalent of the foods and nutrition required in the undergraduate curriculum for the general major in home economics and, in addition, 3-5 hours in foods, dietetics, and nutrition; also quantitative chemical analysis.

As preparation for graduate work with a major in general home economics a student must have had the equivalent of the undergraduate curriculum for the general major in home economics, including a course in the principles of economics.

In addition to graduate courses in home economics the student will offer, for a major in foods and nutrition, either Chemistry 50a or 40 and 41, and for the general major, further courses in education, economics, or sociology.

Graduate students who choose home economics as a minor for the degree of Doctor of Philosophy must have had adequate preliminary preparation in foods and nutrition and must include among the courses to be taken for the minor either Home Economics 41 and 103 or 35 and 105, or must have had their equivalent. Of the courses open to advanced undergraduates, selection may be made from courses 20, 33, 35, 39a, 39b, and 41.

Courses for Graduates

101. Home Economics.—Twice a week; both semesters. *One unit.* Professor Wardall.

102. Research in Nutrition.—Both semesters. *One-half to three units.* Assistant Professor Outhouse.

103. Nutrition Seminar.—Once a week; both semesters. *One-half unit.* Assistant Professor Outhouse.

104. Research in Foods.—Both semesters. *One-half to three units.* Associate Professor Woodruff.

105. Foods Seminar.—Once a week; both semesters. *One-half unit.* Associate Professor Woodruff.

Courses for Graduates and Advanced Undergraduates

20. Physical Growth and Nutrition.—Twice a week; first semester. Assistant Professor Outhouse.

28. Organization and Management of the Home.—Twice a week; second semester. Assistant Professor Nickell.

31. Clothing.—Three times a week; second semester. Miss Whitlock.

33. Diet in Disease.—Three times a week; second semester. Assistant Professor Barto.

35. Problems in Foods.—Three times a week; both semesters. Associate Professor Woodruff.

39a–39b. Readings in Food and Nutrition.—Once a week; both semesters. Associate Professor Woodruff; Assistant Professors Outhouse, Barto.

41. Problems in Nutrition.—Three to five times a week; second semester. Assistant Professor Outhouse.

43a–43b. Problems in Textiles and Clothing.—Three times a week; both semesters. Assistant Professor Jacobsen; Miss Whitlock, Miss Eades.

45. Organization and Teaching of Nutrition Classes.—Twice a week; second semester. Assistant Professor Barto.

48. Institution Dietaries and Administration.—Three times a week; second semester. Assistant Professor Smith.

50. Costume Design.—Twice a week; second semester. Miss Eades.

51. Textiles.—Three times a week; second semester. Assistant Professor Jacobsen.

55. Food and Nutrition.—Five times a week; first semester. Assistant Professor Outhouse, Mrs. Meyer.

56. The Child and His Development.—Twice a week; second semester. Assistant Professor Walls.

57a-57b. Problems in Home Management.—Three times a week; both semesters. Assistant Professor Nickell.

HORTICULTURE

Graduate work is offered in the Department of Horticulture leading to the M.S. and Ph.D. degrees. Candidates may specialize for either degree in floriculture, olericulture, or pomology.

Twenty hours of collegiate work in horticulture and allied subjects are required for entrance upon major work, and twelve hours for minor work.

Courses for Graduates

103. Olericulture.—Once a week; both semesters. *One to two units.* Professor Lloyd.

105. Marketing Fruits and Vegetables.—See Agricultural Economics 135.

106. Olericulture Seminar.—Once a week; first semester. *One-fourth unit.* Professor Lloyd.

108. Pomology.—Three times a week; both semesters. *One to four units.*
(a) Pomological Problems.—Professor Blair.
(b) Pomology and Fruit Breeding.—Professor Dorsey.
(c) Pomological Physiology.—Professor Ruth.
(d) Small Fruits.—Professor Colby.
(e) Pomological Pathology.—Professor Anderson.

115. Floriculture.—Once a week; both semesters. *One to two units.*
(a) Floricultural Problems.—Professor Dorner.
(b) Floricultural Physiology and Pathology.—Associate Professor Weinard.

120. Pomology Seminar.—Once a week; both semesters. *One-fourth unit.* Professors Dorsey, Ruth, Anderson.

125. Fruit Development.—Three times a week; first semester. *One unit.* Professor Dorsey.

130. Physiology of Fruit Production.—Three times a week; first semester. *One unit.* Professor Ruth.

135. Fruit Disease Research.—Three times a week; first semester. *One unit.* Professor Anderson.

140. Advanced Small Fruit Culture.—Three times a week; second semester. *One unit.* Professor Colby.

Courses for Graduates and Advanced Undergraduates

143. Greenhouse Fertilizers.—Three times a week; first semester. Associate Professor Weinard.

144. Current Pomological Literature.—For seniors and graduates specializing in pomology. Once a week; both semesters. Professor Ruth.

145. Plant Nutrition.—Three times a week; second semester. Associate Professor Weinard.

146. Marketing Horticultural Products.—See Agricultural Economics 36.

147. Fruit Storage.—The effects of environment upon fruits. The storage of fruits. Three times a week; first semester. Professor Ruth.

151. Fruit Diseases.—Three times a week; second semester. Professor Anderson.

LIBRARY SCIENCE

Before beginning work for the master's degree in library science students must have completed at least thirty semester hours' work in library science in this institution or in an approved institution.

Students desiring to prepare for work in special types of libraries will be expected to include at least one unit of advanced courses in appropriate subjects other than library science. All such changes in the program of the student must be approved by the Director of the Library School.

Graduate students working toward the master's degree with a major in library science must complete the thesis within three years after first registration therein, unless there is approval of a longer period based upon unusual contingencies.

Courses for Graduates

101. Thesis.—*One to two units.* Professor Windsor and others.

102. Seminar.—Both semesters. *One to three units.*
(a) Techniques of the Study of Reading Interests.—Once a week; two hours; first semester. *One unit.* Assistant Professor Boyd.
(b) College and University Library Administration.—Once a week; two hours; second semester. *One unit.* Professor Windsor.
(c) Publishers.—(Not given in 1935-36.)
(d) Special Libraries.—
(e) Individual Problems.—*One unit.* Professor Windsor and others.

103a-103b. Advanced Reference.—Twice a week; both semesters. *One-half to one unit.* Miss Phelps.

104a-104b. Advanced Cataloging and Classification.—Once a week; two hours; both semesters. *One-half to one unit.* Assistant Professor Bond.

Courses for Graduates and Advanced Undergraduates

7. History of Libraries.—Twice a week; second semester. Miss Singleton.

9. History of Books and Printing.—Twice a week; second semester. (Not given in 1935-36.)

13a. Government Publications.—Production, distribution, and use as reference material of United States federal publications. Twice a week; first semester. Miss Phelps.

24a–24b. Book Selection for Special Groups.—Twice a week; both semesters. Miss Hostetter.

42. Government Publications.—The use as reference material of American, state, and municipal documents, and of publications of foreign governments. Three times a week; second semester. Miss Phelps.

44. Bookbuying for the Large Library.—Twice a week; first semester. (Given in alternate years; not given in 1935-36.) Miss Garver.

45. Library Buildings and Equipment.—Twice a week; first semester. Mr. Lyle.

46. High School Library Administration.—Three times a week; second semester. Miss Hostetter.

48. Public Library Administration.—Three times a week; second semester. Mr. Lyle.

49. Children's Literature.—Twice a week; second semester. Miss Hostetter.

MATHEMATICS

Students entering on graduate study with a major in mathematics must have had twenty hours of undergraduate work in mathematics besides the usual freshman courses in algebra, trigonometry, and analytic geometry, including a one-year course in calculus and one year of more advanced work in one or more of the fields of algebra, analysis, and geometry. They should be able to read German or French.

Candidates for a doctor's degree taking a first minor in mathematics are expected to have completed a course in calculus and are required to take two one-year courses beyond the calculus; candidates for a doctor's degree taking a second minor are required to complete at least one course throughout a year beyond the calculus.

The more technical courses offered by the department are arranged mainly in cycles of two or of three years, so that a properly qualified student will usually have opportunity to take any particular course at some time during the three years of residence required for the doctor's degree.

Courses for Graduates

100. Seminar.—For thesis work, or for special reading with the consent of the instructor. Three times a week; both semesters. *One to two units.* Professors Carmichael, Emch, Coble; Associate Professors Crathorne, Hazlett, Lytle; Assistant Professors Levy, Brahana, Trjitzinsky. For the master's degree: Assistant Professor Bailey; Dr. Steimley, Dr. Ketchum, Dr. Bourgin, Dr. Pepper.

101. Functions of Real Variables.—Three times a week; both semesters. *One unit.*

110. Elliptic Functions.—Three times a week; both semesters. *One unit.* Professor Carmichael.

111. Differential Equations and Asymptotic Expansions.—Three times a week; both semesters. *One unit.* (Not given in 1935-36.) Assistant Professor Trjitzinsky.

112. Linear Difference Equations.—Three times a week; both semesters. *One unit.* (Not given in 1935-36.) Professor Carmichael.

113. Linear Differential Equations.—Three times a week; both semesters. *One unit.* (Not given in 1935-36.) Professor Carmichael.

114. Partial Differential Equations.—Three times a week; both semesters. *One unit.* Assistant Professor Trjitzinsky.

126. Theory of Groups.—Three times a week; both semesters. *One unit.* Assistant Professor Brahana.

129. Theory of Statistics.—The mathematical theory underlying statistics with applications to problems in economics, biology, and sociology. Three times a week; both semesters. *One unit.* (Not given in 1935-36.) Associate Professor Crathorne.

131. Algebraic Geometry.—Three times a week; both semesters. *One unit.* Professor Coble.

135. Differential Geometry.—Three times a week; both semesters. *One unit.* (Not given in 1935-36.) Assistant Professor Levy.

143. Linear Algebras.—Three times a week; both semesters. *One unit.* (Not given in 1935-36.) Associate Professor Hazlett.

170. Algebra.—Three times a week; both semesters. *One unit.* Associate Professor Hazlett.

171. Analysis.—Three times a week; both semesters. *One unit.* Dr. Ketchum.

172. Geometry.—Three times a week; both semesters. *One unit.* Professor Emch.

Courses for Graduates and Advanced Undergraduates

16–17. Differential Equations and Advanced Calculus.—Three times a week; both semesters. Assistant Professor Bailey, Dr. Steimley.

21. Theory of Probability.—Three times a week; second semester. Associate Professor Crathorne.

22. Statistics.—May be counted only toward a minor in mathematics. Three times a week; first semester. Associate Professor Crathorne.

30–31. Actuarial Theory.—Three times a week; both semesters. Associate Professor Crathorne.

32. History of Mathematics.—Three times a week; second semester. Associate Professor Lytle.

35. Teachers' Course.—May be counted only toward a minor in mathematics. Three times a week; both semesters. Associate Professor Lytle.

36. Advanced Aspects of Euclidean Geometry.—Three times a week; first semester. (Not given in 1935-36.) Associate Professor Lytle.

40. Fundamental Concepts of Mathematics.—Three times a week; both semesters. Dr. Pepper.

52. Differential Equations of Mathematical Physics.—Three times a week; both semesters. Dr. Bourgin.

53. Integral and Operational Equations in Mathematical Physics.—Three times a week; both semesters. (Not given in 1935-36.) Dr. Bourgin.

70. Introduction to Higher Algebra.—Three times a week; both semesters. Dr. Miles.

71. Introduction to Higher Analysis.—Three times a week; both semesters. Professor Coble.

72. Introduction to Higher Geometry.—Three times a week; both semesters. Assistant Professor Levy.

MECHANICAL ENGINEERING

The prerequisite for graduate work in mechanical engineering is the equivalent of the undergraduate course required for the degree of Bachelor of Science in mechanical engineering in the branches of the subject in which registration is desired. Courses offered to junior and senior students are open for minor credit to students majoring in other departments.

Courses for Graduates

107. Thermodynamics.—Application of thermodynamics to the solution of physical and engineering problems. Twice a week; both semesters. *One unit.* Associate Professor Goff.

108. The Flow of Fluids and Heat Transfer.—The application of dimensional analysis and other rational formulas. Special problems. Twice a week; both semesters. *One unit.* Professor Macintire.

109. Mechanical Engineering Design.—(a) Machine design; (b) power plant design; (c) dynamics of machinery. Twice a week; both semesters. *One unit.* Professors Leutwiler, Ham.

110. Advanced Heating, Ventilating, and Air Conditioning.—Applications of various systems, notable developments, and results of research. Individual problems. Twice a week; both semesters. *One unit.* Professor Severns.

112. Laboratory Investigations.—Special problems in: (a) combustion; (b) steam; (c) gas and oil engineering; (d) heating, ventilation, and air conditioning; (e) refrigeration; (f) flow of fluids; (g) heat transfer; (h) mechanical transmission of power. Three times a week; both semesters. *One and one-half units.* Professors Polson, Kratz, Ham, Macintire; Associate Professor Goff.

117. Advanced Refrigerating Engineering.—Advanced theory and special cycles. Design of comfort cooling and other special installations. Twice a week; both semesters. *One unit.* Professor Macintire.

MINING ENGINEERING

The prerequisite for graduate work in mining engineering is the equivalent of the undergraduate courses required for the degree of Bachelor of Science in mining in the branches of the subject in which registration is desired.

Courses for Graduates

101. Advanced Mining Practice.—Twice a week; either semester. *One unit.* Professor Callen.

102. Advanced Preparation of Coal and Ores.—Twice a week; either semester. *One unit.* Assistant Professor Mitchell.

104.[1] Mining Reports.—Twice a week; either semester. *One unit.* Professor Callen.

105.[1] Welfare Work and Education among Mine Employees.—Twice a week; either semester. *One unit.* Professor Callen.

106.[1] Advanced Coal, Ore, and Metallurgical Plant Design.—Twice a week; second semester. *One unit.* Assistant Professor Mitchell.

107.[1] Advanced Non-Ferrous Metallurgical Projects.—Twice a week; either semester. *One unit.* Assistant Professor Mitchell.

Courses for Graduates and Advanced Undergraduates

6. Mechanical Engineering of Mines.—Three times a week; first semester. Professor Callen.

8. Mine Administration.—Three times a week; first semester. Mr. Nicholson.

9. Preparation of Coal and Ores.—Three times a week; first semester. Assistant Professor Mitchell.

15. Mine Ventilation.—Twice a week; second semester. Professor Callen.

20. Mine Ventilation Laboratory.—Twice a week; second semester. Professor Callen.

21. Mine Examination and Valuation.—Three times a week; second semester. Mr. Nicholson.

41. Principles of Mining and Metallurgical Design.—Three times a week; first semester. Assistant Professor Mitchell.

42. Mining and Metallurgical Design.—Twice a week; second semester. Assistant Professor Mitchell.

64. Mining Laboratory.—Twice a week; second semester. Assistant Professor Mitchell.

PHILOSOPHY

Students who enter on graduate work with philosophy as their major subject must have had a general course in the history of philosophy, a course in logic, and a general course in psychology.

Courses for Graduates

103. Ethics.—Twice a week; first semester. *One unit.* Professor Morrow.

105. Seventeenth Century Continental Thought.—Twice a week; first semester. *One unit.* Assistant Professor Gotshalk.

106. English and American Idealism.—Twice a week; second semester. *One unit.* Professor Morrow.

108. Plato.—Twice a week; first semester. *One unit.* Professor Tawney.

112. German Idealism (Kant).—Twice a week; second semester. *One unit.* Assistant Professor Gotshalk.

118. Medieval Philosophy.—Twice a week; second semester. *One unit.* Professor Tawney.

119. Seminar in Ancient Philosophy.—Twice a week; first semester. *One unit.* Professor McClure.

[1]Of courses 104 and 105 only one will be given either semester, according to election of students; the same applies to courses 106 and 107.

120. Seminar in Modern Philosophy.—Twice a week; second semester. *One unit.* Professor McClure.

Courses for Advanced Undergraduates and Graduates

3. History of Ancient and Medieval Philosophy.—Three times a week; first semester. Assistant Professor Nicholson.

4. History of Modern Philosophy.—Three times a week; second semester. Assistant Professor Gotshalk.

8. Philosophy of the Recent Past.—Three times a week; first semester. Assistant Professor Nicholson.

9. Philosophy of Law and of the State.—Three times a week; second semester. Professor Morrow.

10. Philosophy of Science.—Three times a week; first semester. Assistant Professor Gotshalk.

11a. Philosophy of Religion (Systematic).—Three times a week; first semester. Professor Tawney.

11b. Philosophy of Religion (Historical).—Three times a week; second semester. Professor Tawney.

12. Philosophy of Art.—Three times a week; first semester. Assistant Professor Gotshalk.

16. Metaphysics.—Three times a week; second semester. Assistant Professor Gotshalk.

22. American Philosophy (Royce, James, Santayana, and Dewey).—Three times a week; second semester. Dr. DeLargy.

PHYSICS

A year of calculus and a year of general physics, with laboratory, are prerequisite for all major and minor graduate work in physics. In addition, graduate students majoring in physics must have had one more advanced course in either physics or mathematics and should be able to use references in German.

Courses for Graduates

122. Dynamics.—Three times a week; both semesters. *One unit.* Professor Kunz; Assistant Professor Bartlett.

123. Dynamical Theory of Sound.—Three times a week; first semester. *One unit.* Professor Watson.

124. Conduction of Electricity through Gases.—Three times a week; first semester. *One unit.* Professor Knipp.

125. Hydrodynamics. — Especially modern problems in flow and turbulence. Three times a week; second semester. *One unit.* (Not given in 1935-36.) Professor Kunz.

126. Theory of Elasticity.—Three times a week; second semester. *One unit.* (Not given in 1935-36.) Professor Kunz.

127. Relativity.—Three times a week; first semester. *One unit.* Assistant Professor Mott-Smith.

128. Problems and Methods in Theoretical Physics.—Three times a week; first semester. *One unit.* Professor Kunz.

129. Mechanical Vibrations.—The general theory, with applications to plates, rotating shafts, gyroscopes, structures, etc. Twice a week; both semesters. *One-half unit.* (Not given in 1935-36.) Professor Kunz.

131a. Physical Laboratory Technique. — Especially glassblowing and discharges in gases. Second semester. *One unit.* Professor Knipp.

131b. Physical Laboratory Technique.—Especially spectroscopic light sources and electronic phenomena. Second semester. *One unit.* (Not given in 1935-36.) Assistant Professor Kruger.

144. Electric and Magnetic Measurements.—Both semesters. *One unit.* (Not given in 1935-36.) Professor Knipp, Associate Professor Williams.

146. Electrodynamics.—Three times a week; both semesters. *One unit.* (Not given in 1935-36.) Assistant Professor Bartlett.

147. Electric Oscillations.—Twice a week; both semesters. *One-half unit.* (Not given in 1935-36.) Professor Kunz.

160. Thermodynamics.—Three times a week; first semester. *One unit.* (Not given in 1935-36.) Professor Kunz.

163. Statistical Mechanics.—Three times a week; second semester. *One unit.* Assistant Professor Mott-Smith.

170. Light.—Largely physical optics and spectroscopy. Lectures, assigned readings and recitations, with laboratory experiments. Both semesters. *One to two units.* Dr. Almy.

183. Nuclear Structure.—Three times a week; first semester. *One unit.* Assistant Professor Bartlett.

184. Line Spectra and Atomic Structure.—Three times a week; first semester. *One unit.* Assistant Professor Kruger.

185. Band Spectra and Molecular Structure.—Three times a week; second semester. *One unit.* (Not given in 1935-36.) Dr. Almy.

186a–186b. Quantum Mechanics.—Three times a week; both semesters. *One unit.* (Not given in 1935-36.) Assistant Professor Mott-Smith.

190. Research.—Both semesters. *One to three units.* Professors in the department.

198. Seminar.—Both semesters. *One to two units.* Professors in the department.

199. Physics Colloquium.—Attendance is expected of all graduate students. Once a week; both semesters. *No credit.* Assistant Professor Mott-Smith.

Courses for Graduates and Advanced Undergraduates

14a-14b. Theoretical Mechanics.—Three times a week; both semesters. Assistant Professor Mott-Smith.

15. Electricity and Magnetism.—Recommended to students in non-technical courses who wish a knowledge of electricity and magnetism beyond the course in general physics. Two recitations or lectures and one three-hour laboratory exercise weekly; second semester. Associate Professor Williams.

16. Heat.—Introductory course. Three times a week; first semester. Associate Professor Paton.

17. Light.—Recommended to students in non-technical courses. Two lectures and a three-hour laboratory period weekly; first semester. Associate Professor Schulz.

23. Sound.—Three times a week; second semester. Professor Watson.

25. Architectural Acoustics.—Twice a week; second semester. (Not given in 1935-36.) Professor Watson.

30. Introduction to Theoretical Electricity. — For advanced students in physics, chemistry, mathematics, and engineering. Three times a week; first semester. Associate Professor Williams.

44a–44b. Electric and Magnetic Measurements.—Two three-hour periods a week; both semesters. Professor Knipp; Associate Professor Williams.

46. Advanced Electrical Measurements.—Two three-hour laboratory periods weekly; second semester. (Not given in 1935-36.) Associate Professor Williams.

51. Practical Optics.—Two lectures and a three-hour laboratory period weekly; second semester. Associate Professor Schulz.

60. Heat.—Three times a week; second semester. Associate Professor Paton.

61. Heat Laboratory.—To accompany Physics 60. One three-hour period a week; second semester. Associate Professor Paton.

62. Kinetic Theory of Heat and Radiation.—Three times a week; second semester. (Not given in 1935-36.) Associate Professor Paton.

71a–71b. Light.—For advanced students in physics, chemistry, mathematics or engineering. Twice a week; both semesters. Dr. Almy.

72a–72b. Light Laboratory.—To accompany Physics 71a-71b. Twice a week; both semesters. Dr. Almy.

78. Radioactivity, Nuclear Physics, and X-rays.—Three times a week; second semester. (Not given in 1935-36.) Professor Loomis.

80. Atomic Physics.—A lecture and problem course presenting our modern knowledge of the nature and properties of atoms, ions, electrons, protons, positrons, light quanta, photoelectricity, thermoelectric emission, x-rays, radioactivity, and cosmic rays. Three times a week; second semester. Assistant Professor Kruger.

PHYSIOLOGY

The prerequisites for graduate work in physiology are Physiology 1 or 4, 6, 7, and 9, or equivalents.

Courses for Graduates

101. Journal Club.—Review of literature. Both semesters. *One-fourth unit.* Associate Professor Burge.

102. Research.—Both semesters. *One to two units.* Associate Professor Burge.

103. Special Phases of the Physiology of Respiration, Circulation, Digestion, Metabolism, Excretion, Secretion, Glands of Internal Secretion, Nervous System.—Both semesters. *One-half to one unit.* Associate Professor Burge, Dr. Steggerda.

Course for Graduates and Advanced Undergraduates

6–7. Advanced Mammalian Physiology.—Five times a week; both semesters. Dr. Steggerda.

POLITICAL SCIENCE

Graduate work in political science is conducted in the following special fields: (1) political theory; (2) international law and diplomacy; (3) modern government; (4) constitutional law, administrative law, and jurisprudence; (5) public administration.

To be admitted to take political science as a major subject, the student must have done at least 18 hours of undergraduate work in political science, economics, and history, not less than nine hours of which have been in political

science. To take political science as a minor he must have had at least nine hours' work in these fields, including six hours in political science.

If a student making political science his major is taking both of his minors in other departments, one of them must be in history, economics, or sociology.

Several courses given in other departments are so closely related to those in political science that graduate students whose major is political science may be permitted on petition to take such courses as part of their major work. Attention is called to the courses in public law in the College of Law, the courses in city planning given by the College of Fine and Applied Arts, and the technical courses in municipal and sanitary engineering in the College of Engineering.

Courses for Graduates

101. History of Political Theories.—Three times a week; first semester. *One unit.* Professor Garner.

102. The Nature of the State.—Twice a week; second semester. *One unit.* Professor Fairlie.

103. Seminar in Political Science and Public Law.—Once a week; both semesters. Members of the department.

104. Municipal Administration.—Twice a week; second semester. *One unit.* Professor Fairlie.

105. Constitutional Law: Research in Selected Topics.—Twice a week; first semester. *One unit.* (Not given in 1935-36.) Professor Mathews.

106a–106b. Special Topics in International Law.—Research course. Twice a week; both semesters. *One unit.* Professor Garner.

107. Foreign Relations of the United States.—Twice a week; first semester. *One unit.* (Not given in 1934-35.) Professor Mathews.

108. Problems of International Organization.—Special problems in the field of international organization, with particular attention to the League of Nations. Twice a week; first semester. *One unit.* Professor Berdahl.

112. Studies in Public Administration.—Special topics in national, state, or local administration in the United States. Once a week; first semester. *One unit.* Professor Fairlie.

113. State Government: Research in Selected Topics.—First semester. *One unit.* Professor Mathews.

114. Studies in Political Parties.—Twice a week; second semester. *One unit.* Professor Berdahl.

121. Problems in British Administration.—Once a week; time to be arranged. *One unit.* Professor Fairlie.

Courses for Graduates and Advanced Undergraduates

4. Municipal Government.—Three times a week; first semester. Associate Professor Kneier.

5. The American Constitutional System.—Three times a week; first semester. Professor Mathews.

6a. International Law.—Three times a week; first semester. Professor Garner.

6b. International Law.—(Continuation of 6a.) Three times a week; second semester. Professor Garner.

7. American Foreign Relations.—Three times a week; first semester. Professor Mathews.

8. International Organization.—Twice a week; first semester. Professor Berdahl.

9. Principles of Jurisprudence. — Three times a week; second semester. Professor Fairlie.

11. The Constitution and Industrial Legislation.—Three times a week; second semester. Assistant Professor Hyneman.

12. Public Administration.—Three times a week; first semester. Professor Fairlie.

13. Government Regulation of Business.—Three times a week; first semester. Assistant Professor Hyneman.

14a. Political Parties: Party History and Issues.—Three times a week; second semester. (Not given in 1935-36; alternates with Political Science 14b.) Professor Berdahl.

14b. Political Parties: Party Organization and Methods.—Three times a week; first semester. (Alternates with Political Science 14a.) Professor Berdahl.

18. Legislation in the United States.—Three times a week; second semester. (Not given in 1935-36.)

21. British Government.—Twice a week; first semester. Professor Fairlie.

22. Continental European Governments.—The constitutions and political systems of the principal countries of continental Europe. Three times a week; second semester. Professor Garner.

28. Current Governmental Problems.—Twice a week; second semester. (Not given in 1935-36.) Professor Mathews.

32. Principles of Political Science.—Twice a week; second semester. Professor Fairlie.

34. Municipal Problems.—Municipal administration in the United States and Europe. Three times a week; second semester. Associate Professor Kneier.

PSYCHOLOGY

Graduate students who elect psychology as their major subject must have had standard courses, of university grade, both in general psychology and in the psychological laboratory. One general university course is the minimal requirement for graduate students who apply to the department for a minor subject.

Courses for Graduates

102. Translation of Psychological Treatises.—Critical reading of French and German books and articles. Both semesters. *One-half unit.* Professor Woodrow.

103. Research.—Experimental investigations. Both semesters. *One-half to two units.* Professors Woodrow, Young; Associate Professor Culler; Assistant Professor Higginson.

105. Seminar. — Discussion of current topics in their historical setting, with especial emphasis upon research problems. Both semesters. *One unit.* Professor Woodrow.

106. Neural Theory of the Psychological Functions.—Second semester. *One unit.* Associate Professor Culler.

108. Quantitative Methods. — The logic of research methods in psychology. Second semester. *One unit.* Associate Professor Culler.

Courses for Graduates and Advanced Undergraduates

5. Comparative Psychology.—A systematic survey of animal behavior with particular reference to the behavior of the vertebrates. Laboratory and discussion. Three times a week; first semester. Dr. McAllister.

8. Feeling and Emotion. — A critical analysis of the facts, problems, and methods of affective psychology, with special reference to recent physiological studies. Twice a week; second semester. Professor Young.

9. Physiological Psychology.—The physiological basis of conscious experience. Twice a week; first semester. Associate Professor Culler.

10. Mental and Physical Work (Industrial Psychology).—The psychology of work and the factors affecting it, with special reference to work in industry. Twice a week; second semester. Dr. Ruch.

11. Learning and Comprehension. — Processes and functions in acquiring knowledge and skill. Twice a week; first semester. Associate Professor Culler.

12–13. Minor Problems (Advanced Laboratory).—Application of methods suitable to new problems in general and comparative psychology. Three times a week; both semesters. Professor Woodrow; Associate Professor Culler, Dr. McAllister.

14. Social Psychology.—Psychological factors in the control of group behavior and the adjustment of the individual to social situations. Three times a week; second semester. Dr. McAllister.

16. Genetic Psychology.—The psychological development of the individual with special reference to childhood. Twice a week; first semester. Dr. Ruch.

17. The History of Psychology.—Three times a week; second semester. Associate Professor Young.

18. Perception.—Perceptual experience; recent revisions of perceptual theory including the doctrine of the *Gestalt*. Lectures and discussions. Twice a week; second semester. Associate Professor Culler.

20. Systematic Psychology.—A critical study of contemporary systems: behaviorism, *Gestalt psychologie,* structural, functional and dynamic psychology. For seniors and graduates. Twice a week; second semester. Professor Woodrow.

21. Character and Personality.—An analysis of the non-intellectual aspects and determinants of mentality and conduct, with special applications to behavior problems and personnel psychology. Three times a week; first semester. Dr. Sears.

23. Abnormal Psychology. — Analytical consideration of types of behavior deviating from the normal. Three times a week; second semester. Dr. Sears.

26. Recent Experimental Problems.—Recent experimental methods and results. Twice a week; first semester. Dr. McAllister.

28. The Psychology of Motivation.—Instinct, drive, desire, habit, and attitude as determinants of behavior; mental conflicts and types of adjustment. Twice a week; first semester. Associate Professor Young.

34. Individual Differences.—A study of the variation in the mental characteristics of individuals and of groups. Three times a week; first semester. Professor Woodrow.

RAILWAY ENGINEERING

The prerequisite for graduate work in railway engineering is the equivalent of the undergraduate courses required for the degree of Bachelor of Science in railway engineering in the branch of the subject in which registration is desired.

Certain courses offered senior students are open to graduates for minor credit. Courses 5 and 8 (Railway Laboratory) may be taken among major subjects.

Courses for Graduates

102. Locomotive Design.—Once a week; either semester. *One unit.* Professor Young.

106. Locomotive Operation.—Once a week; either semester. *One unit.* Professor Schmidt.

110. Railway Location.—Twice a week; either semester. *One unit.* Professor King.

ROMANCE LANGUAGES AND LITERATURE

A student entering on graduate work for an advanced degree must have had at least three years of college work in his major subject, including one advanced literary course.

Students who enter with a knowledge of Latin and of a second Romance language, together with a reading knowledge of German, will find their work for an advanced degree greatly facilitated.

FRENCH

Courses for Graduates

101. Old French Literature.—Twice a week; both semesters. *One unit.* Professor Oliver.

102. Villon, Rabelais, Montaigne, La Pléiade.—Twice a week; both semesters. *One unit.* Assistant Professor Will.

103. Seventeenth Century Literature.—Twice a week; both semesters. *One unit.* Professor Oliver.

104. Eighteenth Century Literature.—Twice a week; both semesters. *One unit.* (Not given in 1935-36.) Professor Oliver.

127. French Romanticism.—Twice a week; both semesters. *One unit.* (Not given in 1935-36.) Professor Carnahan.

128. Origin and Development of the Novel in France.—Twice a week; first semester. *One unit.* Professor Carnahan.

129. Research Problems in French Romanticism.—Twice a week; both semesters. *One unit.* (Not given in 1935-36.) Professor Carnahan.

132. French Symbolism in Prose and Verse and the English and American Influences.—Twice a week; both semesters. *One unit.* (Not given in 1935-36.) Professor Michaud.

133. Victor Hugo, His Influence and His Critics.—Twice a week; both semesters. *One unit.* Professor Michaud.

144. Le Réalisme et le Naturalisme Français.—(In French.) Twice a week; both semesters. *One unit.* (Not given in 1935-36.) Professor Michaud.

145. Doctrines Littéraires et Courants d'Idées Contemporains.—(In French.) Twice a week; both semesters. *One unit.* Professor Michaud.

175. Old French Phonology and Morphology.—Twice a week; both semesters. *One unit.* (Not given in 1935-36.) Professor Oliver.

195. Seminar.—Research work in special topics. Both semesters. *One to two units.* Members of the department.

Courses for Graduates and Advanced Undergraduates

10a–10b. General Survey of French Literature.—Three times a week; both semesters. Professor Carnahan; Assistant Professor Jacob.

17a–17b. French Drama of the Nineteenth Century.—Twice a week; both semesters. Associate Professor Hamilton; Assistant Professor Will.

24a–24b. French Drama of the Seventeenth and Eighteenth Centuries.—Three times a week; both semesters. Professor Oliver.

32a–32b. The French Novel of the Nineteenth Century.—Three times a week; both semesters. Assistant Professor Jacob.

33a–33b. La Littérature Contemporaine.—(In French.) Twice a week; both semesters. (Not given in 1935-36.) Professor Michaud.

34a–34b. Balzac et le Roman Social.—(In French.) Twice a week; both semesters. Professor Michaud.

ITALIAN

Courses for Graduates

140. Italian Literature in the Middle Ages. Petrarch, Boccaccio.—Twice a week; both semesters. *One unit.* (Not given in 1935-36.) Professor Van Horne.

143. Italian Literature in the Renaissance.—Twice a week; both semesters. *One unit.* Professor Van Horne.

146. Modern Italian Literature.—Twice a week; both semesters. *One unit.* (Not given in 1935-36.) Professor Van Horne.

195. Seminar.—Research work in special topics. Both semesters. *One to two units.* Professor Van Horne.

Course for Graduates and Advanced Undergraduates

3a–3b. Dante: The Divine Comedy.—Twice a week; both semesters. Professor Van Horne.

SPANISH

Courses for Graduates

130. Spanish Literature in the Sixteenth Century.—Twice a week; both semesters. *One unit.* Professor Van Horne.

131. Spanish Literature in the Seventeenth Century.—Twice a week; both semesters. *One unit.* (Not given in 1935-36.) Associate Professor Hamilton.

134. Spanish Literature in the Eighteenth Century.—Twice a week; both semesters. *One unit.* (Not given in 1935-36.) Associate Professor Hamilton.

135. La Novela Española Moderna.—(In Spanish.) Twice a week; both semesters. *One unit.* (Not given in 1935-36.) Associate Professor Balseiro.

137. La Crítica Literaria en España.—Twice a week; both semesters. *One unit.* Associate Professor Balseiro.

138. Spanish-American Literature.—Twice a week; both semesters. *One unit.* (Not given in 1935-36.) Professor Van Horne.

185. Old Spanish Readings.—Twice a week; both semesters. *One unit.* Associate Professor Hamilton.

195. Seminar.—Research work in special topics. Both semesters. *One to two units.* Members of the department.

Courses for Graduates and Advanced Undergraduates

10a–10b. General Survey of Spanish Literature.—Three times a week; both semesters. Dr. Burner.

11a-11b. Cervantes: Don Quixote.—Twice a week; both semesters. Associate Professor Hamilton.

17a–17b. El Teatro Español Moderno.—Twice a week; both semesters. Associate Professor Balseiro.

SOCIOLOGY

Preparation for major work in sociology must include at least the equivalent of twenty-three semester hours in the social and biological sciences, of which at least eight must be in sociology. The remaining fifteen hours may be distributed among economics, philosophy, history, psychology, political science, and biology (heredity). Preparation for graduate work in sociology as a minor requires at least six hours of credit in sociology.

Courses for Graduates

100. Sociological Theory.—Twice a week; first semester. *One-half to one unit.* Professor Hiller.

102b. More Recent Developments in Sociology.—Twice a week; second semester. *One unit.*

106. Urban Communities and Urbanization.—Twice a week; first semester. *One unit.* Assistant Professor Tylor.

107. Rural Communities.—Twice a week; second semester. *One unit.* Assistant Professor Tylor.

108. Research in the Social Effects of Poverty, and Their Prevention and Treatment.—Twice a week; first semester. *One unit.* Assistant Professor Timmons.

109. Research in Criminology.—Twice a week; first semester. *One unit.* (Not given in 1935-36.) Professor Taft.

110. Population.—Twice a week; second semester. *One unit.* (Not given in 1935-36.) Professor Taft.

124. Advanced Penology.—Twice a week; second semester. *One unit.* Professor Taft.

128. Fusion of Culture Resulting from Immigration.—Twice a week; second semester. *One unit.* (Not given in 1935-36.) Professor Hiller.

129. Modern Human Migrations.—Twice a week; first semester. *One unit.* (Not given in 1935-36.) Professor Taft.

150. Seminar.—Preparation of theses. *One-half to two and one-half units.* Members of the department.

Courses for Graduates and Advanced Undergraduates

General Courses

3. Social Evolution.—Three times a week; first or second semester. Mr. Ahrens.

4. Social Control.—Twice a week; second semester. Assistant Professor Albig.

6. Urban Sociology.—Three times a week; first semester. Assistant Professor Tylor.

7. Rural Sociology.—Three times a week; second semester. Assistant Professor Tylor.

Specialized Courses

8. Charities.—Three times a week; first or second semester. Assistant Professor Timmons.

9. Criminology.—Three times a week; first or second semester. Professor Taft.

10. Problems of Population.—Three times a week; second semester. Professor Hiller.

14. Group Opinion.—Three times a week; first or second semester. Assistant Professor Albig.

17. Methods of Sociological Research.—Three times a week; first semester. Professor Hiller.

24. Penology.—Three times a week; second semester. Professor Taft.

27. Community Organization.—Three times a week; second semester. Assistant Professor Timmons.

28. Assimilation and Diffusion of Culture.—Three times a week; second semester. Professor Hiller.

29. Modern Human Migrations.—Three times a week; first semester. Professor Taft.

30. Races of Mankind.—Three times a week; first semester. (Not given in 1935-36.)

40. Ethnology of the American Indians.—Three times a week; first semester. (Not given in 1935-36.)

42. Early Civilizations.—Three times a week; first semester. Assistant Professor Albig.

44. Negro Origins.—Three times a week; second semester. (Not given in 1935-36.)

45. Prehistoric Archeology.—Three times a week; first semester. (Not given in 1935-36.)

THEORETICAL AND APPLIED MECHANICS

The prerequisite for the courses for graduates in theoretical and applied mechanics is the equivalent of the undergraduate courses in theoretical and applied mechanics required for the degree of Bachelor of Science in engineering.

Courses offered to senior students are open for minor credit to students majoring in other departments.

Courses for Graduates

101. The Development of Basic Ideas in Mechanics.—Twice a week; first semester. *One unit.* Professor Moore.

103. Hydraulics.—Twice a week; either semester. *One unit.* Professor Enger.

107. Laboratory Investigations in Strength of Materials.—Twice a week; both semesters. *One-half to two units.* Professor Moore.

108. Laboratory Investigations in Hydraulics.—Twice a week; both semesters. *One to two units.* Professor Enger.

109. Laboratory Investigations in Plain and Reinforced Concrete.—Twice a week; both semesters. *One to two units.* Professor Richart.

110. Analytical Study of Experimental Work on Reinforced Concrete.—Beams, frames, and footings. Twice a week; first semester. *One unit.* Professor Richart.

111. Analytical Study of Experimental Work on Reinforced Concrete.—Columns and slabs. Twice a week; second semester. *One unit.* Professor Richart.

112. Structural Mechanics.—Three times a week; first semester. *One unit.* Professor Westergaard.

113. Selected Topics in Structural Mechanics.—Twice a week; second semester. *One-half unit.* Professor Westergaard.

114. Theory of Elasticity with Applications to Engineering Problems.—Three times a week; first semester. *One unit.* Professor Westergaard.

115. Theory of Elasticity with Applications to Engineering Problems (Continuation of 114).—Twice a week; second semester. *One unit.* Professor Westergaard.

116. Resistance of Materials.—Three times a week; first semester. *One-half to one unit.* Professor Seely.

117. The Properties of Engineering Materials.—Three times a week; second semester. *One-half to one unit.* Professor Seely.

Courses for Graduates and Advanced Undergraduates

41. Advanced Mechanics of Materials.—Three times a week; first semester. Professor Seely, Mr. Dolan.

42. Engineering Materials.—Three times a week; second semester. Professor Seely, Mr. Dolan.

43. Laboratory Work in Hydraulics.—Twice a week; first and second semesters. Professor Enger, Mr. Lansford.

44. Laboratory Work in Testing Materials.—Three times a week; first and second semesters. Professors Moore, Putnam.

ZOOLOGY

At least sixteen semester hours of college work in zoology are required for entering on major graduate study in this subject. Under special circumstances advanced work in closely allied subjects may be accepted in lieu of the fourth semester's work in zoology. When zoology is chosen for a minor the courses listed for graduates and undergraduates must be preceded by at least one full year's undergraduate work in zoology.

For the prosecution of graduate study in zoology a reading knowledge of German and French is indispensable and familiarity with Latin and Greek is of great advantage.

Graduate students specializing in zoology are strongly advised to spend at least one summer in study at the seashore. Every candidate for the doctor's degree will be required to furnish evidence of having completed satisfactorily at least one six-week period in such work at an approved location. To facilitate this plan an investigator's room has been provided at the Woods Hole Marine Biological Laboratory, where members of the department are offered research facilities without cost to themselves. Application for the use of this

room should be made to the head of the department early in the year. Similar facilities are sometimes afforded at other marine laboratories.

Students interested in the field of genetics are referred especially to courses 115 and 124.

Courses for Graduates

102. Evolution of Vertebrates.—Twice a week; first semester. *One unit.* (Given in 1935-36 and in alternate years.) Assistant Professor Adams.

103. Cytology.—Twice a week; both semesters. *One unit.* (Given in alternate years; not given in 1935-36.) Professor Shumway.

106. General Embryology.—Problems of development. Twice a week; both semesters. *One unit.* (Given in 1935-36 and in alternate years.) Professor Shumway.

109. Physiological Ecology.—Twice a week; second semester. *One-half to one unit.* (Given in alternate years; not given in 1935-36.) Professor Shelford.

110. Climatic Ecology.—Twice a week; second semester. *One-half to one unit.* (Given in 1935-36 and in alternate years.) Professor Shelford.

111. Experimental and Field Ecology.—Both semesters. *One-half to two units.* Professor Shelford.

115. Factors of Individual and Racial Development.—Twice a week; both semesters. *One unit.* Professor Zeleny.

117. Invertebrate Taxonomy.—Twice a week; second semester. *One-half to one unit.* Professor Van Cleave.

118. Advanced Protozoology.—Twice a week; second semester. *One unit.* Assistant Professor Kudo.

131. Helminthology.—Twice a week; first semester. *One-half to one unit.* Professor Van Cleave and Assistant Professor Thomas.

Individual Research Courses

121. Invertebrate Zoology and Parasitology.—*One to two units.* Professor Van Cleave and Assistant Professor Thomas.

122. Vertebrate Morphology.—*One to two units.* Assistant Professor Adams.

124. Experimental Zoology and Genetics.—*One to two units.* Professor Zeleny.

125. Animal Ecology and Behavior.—*One to two units.* Professor Shelford.

126. Vertebrate Embryology and Cytology.—*One to two units.* Professor Shumway.

128. Protozoology.—*One to two units.* Assistant Professor Kudo.

Courses for Graduates and Advanced Undergraduates

111. Animal Ecology and Geography.—Three or four times a week; first semester. Professor Shelford.

117. Field Zoology.—Two or three times a week; first semester. Professor Van Cleave.

118. Protozoology.—Twice a week; first semester. Assistant Professor Kudo.

119a–119b. Vertebrate Ecology.—Twice a week; both semesters. Assistant Professor Cahn.

120a–120b. Current Investigations.—Must be taken by all graduate students majoring in zoology. Once a week; both semesters. Members of the department.

21a–21b. Introduction to Zoological Research.—Two to five times a week; both semesters. Members of the department.

22–23. Comparative Anatomy of Vertebrates.—Two to four times a week; both semesters. Assistant Professor Adams.

25. Experimental Genetics.—Two or three times a week; second semester. Dr. Luce.

31. Helminthology.—Twice a week; second semester. Assistant Professor Thomas.

63. Comparative Vertebrate Embryology.—Two to five times a week; first semester. Professor Shumway.

66. Vertebrate Organogeny.—Two to five times a week; second semester. Professor Shumway.

74. Advanced Invertebrate Zoology.—Two or three times a week; second semester. Professor Van Cleave.

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UNIVERSITY OF ILLINOIS

The Graduate School

Announcement for 1936-1937

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URBANA

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UNIVERSITY OF ILLINOIS
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(Term 1933-1939)

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GRADUATE SCHOOL CALENDAR

Summer Session

1936

June 15, Monday.....Registration day.
June 16, Tuesday.....Instruction begun.
July 4, Saturday.....Legal holiday.
July 17, Friday.....Latest date for registering for French and German examinations.
July 24, Friday.....Examination in French.
July 31, Friday.....Examination in German.
Aug. 1, Saturday, 12 M.....Latest date for candidates for degrees in August to deposit theses.
Aug. 7, 8, Friday, Saturday.....Summer Session examinations.

First Semester

Sept. 18, 19, Friday, Saturday.....Registration days.
Sept. 19, Saturday, 5 P.M.....Latest date for registration of former students without penalty.
Sept. 19, Saturday.....Latest date for registering for French and German examinations.
Sept. 21, Monday.....Latest date for candidates for masters' degrees in October to file applications for degrees and to deposit theses.
Sept. 23, Wednesday, 8 A.M.....Instruction begun.
Sept. 25, Friday.....Examination in French.
Oct. 2, Friday.....Examination in German.
Oct. 10, Saturday, 12 M.....Latest date for changing study-lists without fee.
Oct. 15, Thursday.....Latest date for preliminary examinations (for full residence).
Nov. 2, Monday.....Latest date for candidates for professional engineering degrees to file statements of professional study and experience.
Nov. 25, Wednesday, 12 M.....Thanksgiving recess begun.
Nov. 30, Monday, 1 P.M.....Instruction resumed.
Dec. 23, Wednesday, 12 M.....Holiday recess begun.
Dec. 31, Thursday, 5 P.M.....Latest date for candidates for professional engineering degrees to submit outlines of theses.

1937

Jan. 4, Monday, 1 P.M.....Instruction resumed.
Jan. 16, Saturday, 12 M.....Latest date for registering for French and German examinations.
Jan. 18, Monday.....Latest date for filing applications for masters' degrees to be conferred in February.
Jan. 18, Monday.....Latest date for candidates for Ph.D. degree in February to deposit theses.
Jan. 22, Friday.....Examination in French.
Jan. 26, Tuesday.....Semester examinations begun.
Jan. 29, Friday.....Examination in German.
Feb. 1, Monday.....Latest date for candidates for masters' degrees in February to deposit theses.
Feb. 3, Wednesday.....Semester examinations ended.

Second Semester

1937

Feb. 5, 6, Friday, Saturday.....Registration days.

Feb. 6, Saturday, 5 P.M.....Latest date for registration of former students without penalty.

Feb. 10, Wednesday, 8 A.M.....Instruction begun.

Feb. 27, Saturday, 12 M.....Latest date for changing study-lists without fee.

Feb. 27, Saturday, 12 M.....Latest date for preliminary examinations (for full residence).

March 1, Monday.....Latest regular date for applications for scholarships and fellowships for 1937-38.

March 25, Thursday, 12 M.....Easter recess begun.

March 30, Tuesday, 1 P.M.....Instruction resumed.

April 1, Thursday.....Latest date for filing applications for masters' degrees to be conferred in June.

April 24, Saturday.....Latest date for registering for French and German examinations.

April 30, Friday.....Examination in French.

May 1, Saturday.....Latest date for candidates for professional engineering degrees to deposit theses.

May 7, Friday.....Examination in German.

May 15, Saturday.....Latest date for filing applications for masters' degrees to be conferred in August.

May 15, Saturday.....Pre-registration for masters' degrees to be conferred in August.

May 17, Monday.....Latest date for candidates for Ph.D. degree in June to deposit theses.

May 28, Friday.....Semester examinations begun.

May 31, Monday.....Latest date for candidates for masters' degrees in June to deposit theses.

May 31, Monday.....Latest date for Ph.D. finals.

June 7, Monday.....Semester examinations ended.

June 14, Monday.....Sixty-sixth Annual Commencement.

Notes

Examination in one foreign language must be passed before residence on second year may be counted (pp. 13, 16).

Two copies of thesis are required of candidates for masters' and doctors' degrees (pp. 13, 17).

Candidates for masters' degrees announce thesis subjects at beginning of second half-year of work, or after completion of four units, or at beginning of third summer session (p. 13).

Candidates for Ph.D. degree announce thesis subjects within six weeks from beginning of third year of residence (p. 17).

Candidates for Ph.D. degree deposit theses two weeks before date of final examination (p. 17).

THE GRADUATE SCHOOL
EXECUTIVE FACULTY

ARTHUR CUTTS WILLARD, B.S., D.Eng., LL.D., *President of the University*

ROBERT DANIEL CARMICHAEL, Ph.D., *Professor of Mathematics and Dean of the Graduate School*

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HARRY STUART VEDDER JONES, Ph.D., *Professor of English*

SIMON LITMAN, Dr.Jur.Pub. et Rer.Cam., *Professor of Economics*

FRANCIS WHEELER LOOMIS, Ph.D., *Professor of Physics*

HERBERT FISHER MOORE, M.E., M.M.E., D.Sc., *Research Professor of Engineering Materials*

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HENRY PERLY RUSK, M.S., *Professor of Cattle Husbandry*

RAYMOND STRATTON SMITH, Ph.D., *Professor of Soil Physics*

THE GRADUATE SCHOOL

History and Organization

The University of Illinois offered facilities for advanced study and research in various lines as early as 1872. Organized graduate instruction, however, under the name of the Graduate School, was first undertaken in 1892. In 1894 the administration of the school was vested in the Council of Administration, and the Vice-President of the University became Dean of the School. In 1906 the Graduate School was organized as a separate faculty.

By action of the Trustees the teaching faculty of the Graduate School includes all members of the University Faculty who give instruction in approved graduate courses. The affairs of the School, however, are in charge of the Executive Faculty.

Admission

Admission to the Graduate School may be granted to graduates of institutions whose requirements for the bachelor's degree are substantially equivalent to those of the University of Illinois and to applicants from other institutions approved by the Executive Faculty, as hereinafter provided. *Admission to the Graduate School does not, however, imply admission to candidacy for an advanced degree, and gives no right or claim to be so admitted. A mere accumulation of "credits" or "grades" is not sufficient.*

Admission to graduate courses may be granted only to those who have had the requisite undergraduate work in those courses or departments. But a student of mature age who satisfies the Dean and the department concerned of his ability to pursue graduate work in a given line may be enrolled in particular graduate courses, without reference to a degree, and permitted to carry on such study or investigation under the direction of a department of the University as the department shall recommend and the Dean approve.

Application blanks for admission may be secured from the Registrar of the University. Every applicant must submit with his application for admission an official transcript of his college record. All students, except those entering only for summer sessions, who have not previously taken a physical examination at the University, must take such an examination. The examination is given by the University Health Service without cost to the student, if taken at the time of appointment during the registration period.

Character of Graduate Work

The principal aim of graduate study is the development of the power of independent work and the promotion of the spirit of research. Each candidate for a degree is expected to have a wide knowledge of his subject and of related fields of work; for the graduate student is not expected to get from lecture and laboratory courses all the knowledge and training necessary to meet the requirements for his degree.

Registration and Program of Study

The following regulations concerning registration and program of studies are laid out primarily for first-year students. Second-year and third-year gradu-

ate students fill out their programs irrespective of the unit value of courses, according to their needs, under the advice of their instructors.

Registration.—Each graduate student must register at the beginning of each semester. The registration of a new student may be accepted at any time provided the student is prepared to take up courses actually under way. Credit towards the fulfillment of the residence requirement dates, however, from the time of registration and not from the beginning of the semester or year in which the student enters.

A new student must fill out in duplicate an application for admission and submit it to the Registrar, from whom, after the approval of his application, he will receive a card of admission and a study-list which will give details of procedure in registering. He should fill out the study-list after consultation with his adviser, or the person in charge of his major work, and also with the instructors whose courses he wishes to elect. *Registration, including the payment of fees, must be completed by the close of the registration days of the Graduate School. Otherwise a fee of $5.00 for late registration will be charged all former students of the University of Illinois.*

Changes in Study-lists.—A graduate student is expected to plan his work so carefully that changes in his study-list during the semester will not be necessary. When a change seems advisable, however, it may be permitted without fee if made within three weeks of the date of registration. After that date a fee of one dollar is charged for each change, except that the total charge for rearrangement authorized on any one change slip shall not exceed two dollars.

Advanced Undergraduate Courses Open to Graduate Students.—

1. *Courses not open to students below senior standing.* Unless otherwise specified on the student's program by the department concerned, such courses listed for four or five hours of undergraduate credit are treated as unit courses for graduate credit, or as half-unit courses when listed for less than four hours of undergraduate credit.

2. *Courses open to students of junior standing.* Unless otherwise specified on the student's program by the department concerned, such courses listed for four or five hours of undergraduate credit are treated as half-unit courses for graduate credit, or as quarter-unit courses when listed for two to three hours undergraduate credit. Courses to which sophomores are regularly admitted may not be taken for graduate credit, either major or minor.

Seniors and Graduate Study.—If at the beginning of the second semester of his senior year a student who has been in residence at least one year is within five hours of a bachelor's degree, he may be permitted to register for courses which may count for residence for a master's degree, provided his program is limited to approximately twelve formal class, lecture, or laboratory exercises a week, and is approved by the Dean at the time of registration. Only students of excellent record will be allowed this privilege.

Miscellaneous and Listeners' Courses.—Graduate students are permitted under proper circumstances to attend classes as listeners, and to elect miscellaneous subjects, that is, courses which do not count toward an advanced degree. A graduate student in full standing and carrying a minimum program, may be permitted, under proper circumstances, to elect one miscellaneous subject (that is, a course which does not count towards an advanced degree). No subject

is open as a miscellaneous course unless it has a specific educational bearing on the student's major or minor subjects of study.

A student who elects a miscellaneous course is required to register in it, do the work, and pass the semester examinations, unless he is permitted to withdraw under the rules. A student who attends as a listener is not permitted to participate in the class work or the examination.

No student may register for a full minimum program of work for graduate credit if it is necessary for him to carry at the same time more than one miscellaneous subject.

Students on the Staff.—Assistants and others on the university staff who undertake to do graduate work are permitted to take an amount of work determined by the terms of their employment. Such a student, if required by his engagements to teach more than five classes a week or to have laboratory work or supervision exceeding ten hours a week, will find it impossible to complete the work for the master's degree in one year, or the doctor's degree in three years.

Residence and Work Done Elsewhere.—Continuous residence and study are required of all members of the Graduate School, unless they are granted leave of absence by the Dean, upon recommendation of the professor in charge of their work, for the purpose of carrying on elsewhere studies or investigation in the line of work for their degrees.

Graduate Study in the Summer.—Graduate students in the summer session are subject to the same scholastic requirements as those in the regular university year. Their study-lists must be approved by the Dean of the Graduate School, or his representative. Two to two and one-half units of graduate work may be taken in the summer session. Two units is considered a full minimum program for the summer. Attendance during four out of six consecutive summer sessions, or one semester and two summer sessions, is considered the equivalent of one year in residence. No course offered in the summer session may be taken for credit towards a higher degree unless it is described in the summer-session circular as accepted for that purpose.

The Executive Faculty may, at the request of a given department, accord recognition to its summer session work subject to the following conditions: (1) Study in the University of Illinois summer session may be counted in partial fulfillment of the residence requirements for the degree of Doctor of Philosophy, but at least one continuous academic year of residence at the University at some time during the second or third years of the doctoral program is required. (2) Persons electing to use this plan shall be required to submit a schedule of study covering the second and third years of work toward the doctorate. This schedule of study must be approved by the adviser in charge of the major subject and by the Dean of the Graduate School. (3) Apart from the provisions stated above, the present practices and standards of the Graduate School relating to the doctorate shall be continued.

Summer Work in Medical Sciences.—Graduate courses in medical sciences are offered in the summer quarter between June and September at the College of Medicine of the University of Illinois in Chicago. Circulars describing the courses offered and conditions of admission and work may be obtained from the Committee on Graduate Work in the College of Medicine, 1853 W. Polk Street, Chicago.

FAILURES.—A graduate student who fails in any course in his major subject cannot secure his degree in the same year in which the failure occurred. No condition examinations are given graduate students.

WITHDRAWAL.—If after registration a graduate student wishes to withdraw from any course or to add other work, he must first secure the necessary papers from the Dean's office. See the regulations concerning changes in study-lists, page 10. If he wishes to withdraw from the University he must get clearance papers at the Dean's office.

Masters' Degrees

CHARACTER OF MASTERS' DEGREES.—The master's degree conferred depends upon the character of the bachelor's degree. The usual practice is that A.M. shall follow A.B., and that M.S. shall follow B.S. However, this practice may be departed from in cases where the undergraduate course of study of the candidate was of a kind for which some reputable institutions in this country give A.B., while others give B.S.

AMOUNT OF WORK REQUIRED.—Candidates for the degree of Master of Arts or Master of Science are required to do at least one full year's work in residence, usually including a thesis. Four to five units constitute a normal semester program for the master's degree. A minimum of eight units must be completed for the degree. Only first-rate students are permitted to secure a degree with this minimum program. In some departments special examinations are required of candidates for masters' degrees. In all cases the student must satisfy the duly approved conditions set by his major and minor departments.

Unless otherwise permitted, every student must take each semester at least one course open to graduate students only (courses numbered 100 and upwards).

In the first year of his graduate study each student is required to attend a minimum of four formal class, lecture, or laboratory exercises a week. Schedules involving an unusually large number of formal class meetings per week will require the special approval of the Dean.

WORK DONE ELSEWHERE.—Members of the staff and high school teachers residing and employed in Urbana or Champaign who have done graduate work in approved institutions elsewhere may secure credit not to exceed four units towards the master's degree by passing examinations in that work. They may complete the work for the degree by securing at least four units more while registered in the Graduate School for not less than one academic year.

Graduate students who have been in residence one semester or its equivalent may offer for credit not more than nine weeks of work at a marine or fresh-water biological laboratory or in biological or geological field work, on condition that the work be of graduate grade under a qualified instructor or director as certified by the student's major adviser and approved by the Dean of the Graduate School; that approval be obtained by the student in advance; and that a written report of the work accomplished be presented by the student and approved as satisfactory by the student's major adviser.

MAJORS AND MINORS.—A candidate for a master's degree may do all his work in one subject, or he may select a major and one minor, or a major and two minors. A major or minor denotes the field of knowledge of a department, or such part thereof as constitutes a separate and independent division of that

field. For a master's degree a major is at least half the work, or a minimum of four units, for one year. Less than one unit may not be counted as satisfying the requirements of a minor without the approval of the department concerned.

Foreign Language.—The ability to use one or more of the modern languages ordinarily studied in the undergraduate curriculum is desirable for all candidates for the master's degree, and in some lines of study is required. No student will be permitted to acquire residence toward the second year for the doctorate until he has passed the preliminary examination in at least one of these languages.

Masters' Theses.—Each candidate for a master's degree is required to present two copies of a thesis on some subject approved by the professor in charge of his major work. Such approval, except in case of students working for masters' degrees in summer sessions only, must be secured and the subject of the thesis filed at the office of the Graduate School not later than the beginning of the second half year of residence. Students working for masters' degrees exclusively in summer sessions must announce their thesis subjects not later than the beginning of their third session in residence. The requirement of a thesis may be waived, however, on the recommendation of the professor in charge of his major work and the approval of the Dean, *provided application to waive the thesis is made at the time for announcing thesis subjects.* A student excused from writing a thesis must replace it with courses of instruction.

No one will be excused from writing a thesis unless one-half of his program of studies consists of courses numbered 100 and upwards.

The thesis required from a candidate for a master's degree will ordinarily demand from one to two units of work, and may not exceed three units except by special permission. The thesis must be typewritten, on "thesis paper,"[1] and the title page must be printed. The carbon copy may be on plain paper of approximately the same weight as the thesis paper. Both copies of the thesis in its final form, together with a certificate of approval by the proper officer, must be left at the Dean's office at least two weeks before the date on which the degree is to be conferred. No article prepared for another use, or previously published, will be accepted as a thesis.

Applications for Degrees.—Each candidate for the degree of Master of Arts or Master of Science shall file an application for the degree on a blank provided for the purpose, to be had at the Dean's office. For the dates of applications and of deposition of theses, consult the calendar at the beginning of the bulletin.

Degrees in August.—Students who expect to become candidates for the master's degree in August may be recommended at the June meeting of the Senate subject to the successful completion of the work for which they are to register in the summer session. However, in order to avail themselves of this privilege, students must file with the Dean before the June meeting of the Senate an exact statement of the work necessary to complete the requirements for the degree. Blanks for this purpose may be secured at the Dean's office. For the dates of filing application and pre-registration blanks, consult the calendar at the beginning of the bulletin.

Thesis Work on Leave of Absence.—Under proper conditions a student may be permitted to complete the last fourth of his work, if devoted to his

[1]No other will be accepted by the Dean. "Instructions for the Preparation of Theses" may be obtained at the Dean's office.

thesis, under leave of absence for a period not to exceed the equivalent of two semesters. To get such permission the student must have secured credit for at least six units; must petition for the privilege; must submit to the Dean an outline of the proposed investigation, approved by the professor in charge of his major work, and must submit satisfactory evidence that adequate facilities are available to him at the place where he intends to do the proposed work. Approval on all these points must be obtained one collegiate year before the thesis is due. Immediately following approval the student must register and pay an incidental fee of $20.00.

GRADES.—Students' work is graded in five classes, A, B, C, D, and E. The last indicates a failure. D indicates unsatisfactory, though passable, work.

A student who receives two units of a grade below B during his first year of graduate work may not complete the first year of residence by carrying the minimum program of eight units for the master's degree. Three units of a grade below B disqualify a student as a candidate for a degree.

A failure or absence from examination in any course or failure in any other examination prescribed by the department of the major may prevent the conferring of the degree; and, as already indicated, failure in any course in the major field precludes the conferring of the degree in the same year.

Second Degrees in Engineering

Two classes of second degrees are open to graduates of the College of Engineering, namely, academic and professional.

The *academic* second degree in engineering is Master of Science, following Bachelor of Science, in civil engineering, electrical engineering, etc. This degree is conferred in accordance with the regulations described above for *academic work in residence only.*

The *professional* second degrees in engineering are as follows:

Master of Architecture, after B.S. in architecture.

Architectural Engineer, after B.S. in architectural engineering.

Ceramic Engineer, after B.S. in ceramic engineering.

Chemical Engineer, after B.S. in Chemical Engineering.

Civil Engineer, after B.S. in civil engineering or in railway civil engineering.

Electrical Engineer, after B.S. in electrical engineering or in railway electrical engineering.

Mechanical Engineer, after B.S. in mechanical engineering or in railway mechanical engineering.

Engineer of Mines, after B.S. in mining engineering.

Engineer-Physicist, after B.S. in engineering physics.

Professional degrees in engineering may be conferred on two classes of candidates: (1) those who have received an academic degree in engineering from the University of Illinois; (2) those who have received an academic degree in engineering[1] from other institutions of equal standing and who have been members of the teaching or research staff of the College of Engineering or Engineering Experiment Station or the Department of Chemistry of the University of Illinois for at least three years prior to the conferring of the professional degree.

[1]Including chemical engineering.

A candidate declares his candidacy by filing with the Dean of the College of Engineering, as chairman of the committee in charge, a detailed statement covering his professional engineering experience. This statement must be made upon a standard form supplied by the Dean of the College of Engineering, as chairman of the committee in charge, and must be filed not later than the first Monday in November preceding the commencement at which the candidate expects to receive the degree. No statement of experience will be considered by the committee which does not show that the candidate has had a minimum of four years of acceptable engineering experience after receiving the degree of Bachelor of Science, and that for at least three years he has been in responsible charge of engineering work. Responsible charge in engineering teaching may be considered as responsible charge of work. In determining the acceptability of the engineering experience of the candidate the committee will be guided by the character of his professional work and the degree of responsibility involved, and will take into consideration such evidences of professional ability and growth as may be shown by his investigation of engineering problems, his contributions to technical literature, and his membership and activity in engineering societies.

If the professional experience of the candidate is accepted he must submit for approval, prior to December 31, an outline of his proposed thesis. The completed thesis, in the form prescribed in the "Instructions for the Preparation of Masters' and Doctors' Theses," must be deposited with the Dean of the College of Engineering not later than May 1. The candidate must present himself at commencement in order to receive the degree.

A candidate for a professional engineering degree must pay the incidental fee of twenty-five dollars on being notified that his professional experience is accepted as qualifying him to enter as a candidate for the degree. No one will be enrolled as a candidate for the degree at the following commencement who does not pay his fee at this time. When a candidate for a professional engineering degree has once been accepted and paid his fee, he is eligible to receive the degree at any time within five years, without additional fee, on completion of the requirements; provided, however, that unless he completes the requirements within two years his name will be dropped from the list of candidates and in order to receive the degree within the five-year period he must register once more.

The Degree of Doctor of Philosophy

Major and Minor Subjects.—A member of the Graduate School who desires to become a candidate for the degree of Doctor of Philosophy is required to pursue a major subject in the department in which his research lies. He is also required to choose one minor subject, or he may choose two. If one minor only is chosen it must be taken in a department of study other than that of the major, and credit for it may be earned by work representing not less than four units, or one-sixth of the total residence required for the doctorate. If two minors are chosen, one must be a subject closely related to the major. With the approval of the adviser and the Dean it may be a division of the major field of study. The other minor (not less than two units) must, in that case, be taken in a department of study other than that of the major.

Except by special permission of the Dean the preliminary examination in major and minor subjects may not be taken until the minor work has been done.

Method of Computing Residence.—Credit for a full year of graduate work means that the student has during that time devoted all his working time and energy to study of a graduate grade. After the first year of residence, credit is not recorded in units, and there is no fixed correspondence between credit and courses as in undergraduate work.

Period of Study.—The normal *minimum* period of study required for securing the degree of Doctor of Philosophy is three years, during which the student is required to devote all his working time to his studies. All three years must be spent in resident graduate study at some accredited educational institution and either the first two or the last one of the three must be spent at the University of Illinois. The degree is conferred, however, not for residence during a certain period, but for scholarly attainments and power of investigation, as proved by a thesis and examinations. For study in summer sessions, see page 11.

Work Done in Other Universities.—Credit for graduate work done in other universities is not "transferred." However, it may be accepted on examination as equivalent to resident work at the University of Illinois, provided the institution in which it was done is of high standing.

Preliminary Examinations.—

A. In Languages.—The student will be required to demonstrate his ability to read French and German and other languages needed in his work. (In special cases the Executive Faculty, upon recommendation of the student's adviser, may substitute for either one of the languages usually required some other language which can be shown to be more useful in that student's professional research.) No student will be permitted to acquire residence towards the second year of graduate study until he has passed the examination in at least one of these languages. Both the examination in French and that in German must be passed before the student is admitted to the preliminary examination in his major and minor subjects. For the dates of these language examinations consult the calendar at the beginning of this bulletin. See calendar for date when application for admission to these examinations must be made.

B. In Major and Minors.—Towards the end of his second year of study, or by special permission, at the beginning of his third year (not later than about October 15), a student who wishes to become a candidate for the degree must submit to a preliminary examination conducted by a committee appointed by the Dean. This examination is intended to test the student's knowledge of the fields of his major and minor subjects of study and to determine whether he is prepared for the final year of work for the doctorate. It is partly oral, and may be wholly so.

The student will not be admitted to his preliminary examination until the faculty is satisfied that he has finished substantially the equivalent of two years' graduate work. He must do a full year's graduate work between his preliminary examination and the completion of his work for the doctorate.

Final Examination.—At least two weeks before the time when the degree is conferred, the candidate must submit to a final examination, given by a committee appointed by the Dean. This examination is primarily on the research work of the student, as embodied in his thesis, but it is not confined to that. It

extends to the whole field of study of the candidate. It will not be confined to the courses which the candidate has attended in the University of Illinois only, if he has done part of the work elsewhere; nor even to the field covered by the courses specifically taken in this or other universities; but will be so conducted as to determine whether the candidate has a satisfactory grasp of his major subject as a whole, and a general acquaintance with the fields of knowledge represented by his course of study.

The final examination may not be divided. The examination must be taken all at one time even though it requires several sessions.

If after having passed his preliminary examination, he fails in the third year of his study to meet the expectations of the professors in charge of his work, or in any way fails to maintain the standard of scholarship and power of research expected of him, he may be refused admission to the final examination.

Other Examinations.—Before the candidate is admitted to the final examination and the defense of his thesis, he may be required to take any other examination, oral or written, that is thought proper by the various departments in which he has studied.

The above examinations are in addition to those in the courses for which the student is registered. These must be taken at the time for which they are set in the examination schedule.

Thesis.—The power of independent research must be shown by the production of a thesis on some topic connected with the major subject of study. The candidate is expected to defend his thesis or dissertation before the members of the faculty, or as many of them as may wish to question him about it, in connection with his final examination.

The subject of the thesis should be chosen not later than the end of the second year of residence and must be submitted for formal approval by the faculty not later than six weeks from the beginning of his third year of residence.

Two typewritten copies of the complete thesis, *the original on thesis paper,*[1] and the first carbon on plain paper of approximately the same weight, and in final form, must be deposited in the office of the Dean for presentation to the examining committee not later than two weeks prior to the final examination and not less than four weeks before the time when the degree is conferred. At the same time, the candidate must deposit with the Dean a manuscript of the essential part, or an abstract, or a digest of his thesis, in condition for publication at a cost not to exceed seventy-five dollars ($75). The manuscript must be sufficient to show the method followed, the evidence used, and the conclusions reached in the investigation, and must bear the approval of the department and the Executive Faculty of the Graduate School.

The candidate must pay to the Comptroller before graduation the sum of seventy-five dollars ($75) out of which the University will print at least one hundred copies of this manuscript for circulation by the University, unless the thesis entire or in abbreviated form is published by the author or is accepted for publication by a standard journal or publisher within a year from the date of graduation. In the latter event, and after one hundred copies have been presented to the University by the writer, the cash deposit shall be returned to him.

[1]No other will be accepted by the Dean.

The typewritten and printed forms of the thesis must comply with the regulations given in "Instructions for the Preparation of Masters' and Doctors' Theses," copies of which may be obtained at the Dean's office.

Degree of Doctor of Philosophy in Engineering

The degree of Doctor of Philosophy in Engineering is offered in certain lines of academic work of a high scholastic type in engineering science for students who wish to prepare themselves as teachers, investigators, and experts.

The general requirements for this degree, as to preliminary education, linguistic attainments, etc., are the same as in other subjects.

The following lines of engineering science, or others approved by the Graduate School, may be elected as majors:

Engineering mechanics
Steam engineering
Hydraulic and sanitary engineering
Electrical engineering
Heating and ventilation engineering
Railway engineering
Masonry construction and structural engineering
Coal-mining engineering
Ceramic engineering
Chemical engineering

The first minor may be any of the above or one of the following sciences or an authorized combination of two of them:

Theoretical mechanics
Mathematics
Thermodynamics
Bacteriology
Chemistry
Geology
Physics (experimental or mathematical)
Zoology
Botany
Economics

The second minor should be in other than engineering subjects.

Agricultural and Engineering Experiment Stations

Attention is called to the unusual opportunities for graduate study in connection with the Agricultural and Engineering Experiment Stations. By undertaking a line of graduate study in close association with some one of the projects carried on in those Stations, the student will come into contact with aspects of his specialty which he would rarely touch in a purely academic study, and he will thus broaden his outlook. The Experiment Stations make available apparatus, equipment, and the services of mechanicians, which may materially facilitate the carrying on of investigations.

Scholarships and Fellowships

A number of scholarships and fellowships have been established by the Trustees of the University open to candidates who are not over thirty years

of age at the time when the appointment is to be made. To first-year graduate students of ability and promise there are open a number of service scholarships with stipends of $300 and carrying exemption from the payment of tuition, incidental, and laboratory fees. There are two classes of fellowships—University Service Fellowships and Honorary Fellowships. The first are open to second-year and third-year graduate students with stipends of $500 and $600, respectively. They are awarded on the condition that their holders shall be available for teaching, research, and other University services not to exceed one-quarter time in each case. To be eligible for a $600 fellowship an applicant must have passed both language examinations before the date for filing applications and must be prepared to take the preliminary examination in his major and minor subjects by the following June. Honorary Fellowships carry no stipends and no exemption from the payment of fees. Their purpose is to give recognition to superior students who are not in need of financial assistance.

Candidates for these scholarships and fellowships must be graduates of the University of Illinois, or of colleges or universities having equivalent requirements for bachelors' degrees.

Application must be made on blanks to be obtained from the Dean of the Graduate School. These application forms should be sent to the Dean of the Graduate School as early as possible in February of the academic year preceding that for which the fellowship is desired. No application will be considered if received later than March first, until after April fifteenth, the date when appointees from the first list of applications must accept or refuse their appointments.

Persons appointed are notified on April first and must send the Secretary of the Board of Trustees notice of their acceptance or refusal by April fifteenth; and must agree that, if accepted, the appointment will not be resigned to take a similar one in any other institution during the year for which it is awarded.

Nominations to fellowships are made on the grounds of worthiness of character, scholastic attainments, and promise of success in the principal line of study or research to which the candidate proposes to devote himself.

Libraries

The general university library, including the departmental libraries and reading rooms listed below, are located at the University in Urbana. The libraries of the College of Pharmacy and the College of Medicine are in Chicago.

These libraries contain about 1,011,000 volumes and about 258,000 pamphlets. Of these, 961,000 books and 250,000 pamphlets are in the libraries at Urbana; the rest are in Chicago. The library at Urbana also contains about 3,500 maps and 9,900 pieces of sheet music. About 8,000 periodicals are currently received, including over 200 newspapers published in Illinois and about 125 foreign language newspapers published in the United States.

The general library of the University is open daily, from 8 a. m. until 10 p. m. and on Sunday from 2:30 p. m. until 5:30 p. m.

In the book stacks are 140 cubicles for the use of faculty members and graduate students.

A number of departmental and college libraries and reading rooms are maintained in the library and in other buildings on the campus; these libraries do not necessarily contain all the books in the respective subjects. In some

instances they are primarily for the use of the graduate students and advanced undergraduate students in the departments using the respective buildings. The principal departmental libraries and reading rooms are the following:

Name of Library	*Location*	*Volumes*
Philosophy, Psychology, and Education	Library Building	10,100
Classics	Library Building	25,000
Modern Languages	Library Building	8,500
English	Library Building	6,800
History and Political Science	Library Building	17,700
Economics, Sociology, and Commerce	Library Building	3,500
Natural History	Natural History Building	55,200
Law	Law Building	54,400
Architecture, Ricker Library of	Architecture Building	11,100
Agriculture	New Agriculture Building	24,500
Chemistry	Chemistry Building	14,900
Physics	Physics Building	1,600
Mathematics	Mathematics Building	11,800
Engineering	Engineering Hall	34,600
Landscape Architecture	New Agriculture Building	5,000

The library includes most of the bibliographical aids published for the book-trade in this and other countries; a Union Card Catalog of books in seven other large American libraries; many printed catalogs of important libraries, e.g., Catalogue of Printed Books in the British Museum, Gesamtkatalog der Preussischen Bibliotheken, and Catalogue Général des livres imprimés de la Bibliothèque Nationale; and many bibliographies of special subjects.

The following brief statements indicate the resources of the library for research in a few subjects selected at random:

Official publications of municipalities number about 32,000 reports, charters, and ordinances, issued by over 3,000 American and 300 foreign municipalities, and more or less complete files of about 50 municipal periodicals. Systematic attempts are made to secure current publications, especially of Illinois municipalities.

Mathematics numbers over 11,000 volumes, about 9,500 dissertations and other pamphlets, and includes files of over 300 periodicals and other serials.

Chemistry includes about 10,100 volumes of bound periodicals, 4,700 other books, 1,500 pamphlets, 7,200 theses, and receives currently 255 journals, most of which are complete sets.

Italian history includes the Cavagna Library, 40,000 volumes, pamphlets, and maps, and 138 bundles of manuscripts with typed partial index to families and places dealt with; much material of Italian local history, biography, and genealogy.

Classical literature, history, and archaeology embraces approximately 30,000 volumes, including complete sets of about 150 journals and serials; the library of Professor Wilhelm Dittenberger, of Halle, 5,600 items acquired in 1907; the library of Professor Johannes Vahlen, of Berlin, 10,000 items acquired in 1913; and a collection of about 17,000 dissertations, reprints, etc.

The Ricker Library of Architecture numbers 11,100 volumes, 10,500 lantern slides, and 9,000 photographs and drawings. It is not only a good working library for faculty and students in architecture, but contains many of the older and rarer works.

Fees and Expenses

Except as noted below, graduate students pay fees as follows:

Matriculation fee	$10.00
Incidental fee, each semester, for residents of Illinois	35.00
All students, not residents of Illinois, pay each semester an incidental fee of	62.50
Incidental fee for students registered for thesis work towards the master's degree on leave of absence	20.00
Graduation fee	10.00
For late registration	5.00
For change in study-list	1.00

All persons on University appointment or on appointment in allied surveys and laboratories in Urbana and the research and educational hospitals in Chicago, eligible for admission to University work, also superintendents, principals, and teachers employed in the public school systems of Illinois and teachers and members of the staff in colleges and universities in this state, when admitted to instruction in the University during the period of their employment, may be permitted to attend University classes for credit, on condition that they register and pay either the regular incidental fees in the Graduate School, or, at their election, fees assessed as follows:

For undergraduate and professional work in the colleges and schools at Urbana, $2.50 a credit hour.

For graduate work at Urbana or Chicago, at the rate of $10 a unit; provided, however, that persons on scholarship or fellowship appointment in the Graduate School, or on University appointment at a salary of $1,600 a year or less, who are registered in the Graduate School, shall be exempt from the payment of such fees, and from laboratory fees, in courses for graduate credit.

All persons shall pay the matriculation and graduation fees.

Table board may be obtained at prices ranging from $5 to $7 a week.

Room rent, single room, ranges from $15 to $25 a month; double room, from $10 to $15 a month, each person.

DEPARTMENTS OF INSTRUCTION

Courses open to graduate students are of two classes. The first class is wholly of graduate grade, and the courses are numbered 100 upwards. The second class includes the courses classified as for graduates and advanced undergraduates. These carry numbers below 100. The courses numbered 100 and upwards are all accepted for major credit. Those of the other group are in many cases accepted for minor credit only. This is especially true of courses which are open to juniors.

All courses have certain prerequisites for admission. Inasmuch as the prerequisite preparation may be gained at other institutions from courses differing from those offering a similar preparation at the University of Illinois, so that a statement of prerequisites as given here would not be understood elsewhere, their description is omitted altogether. However, a student who wishes to enter a particular course must satisfy the department concerned that he has had in some form the prerequisites for admission to the course.

For the convenience of first-year students the credit value of graduate courses is given in units. These values have no significance for second-year and third-year students.

The credit received for "courses for graduates and advanced undergraduates" is in accordance with the regulations of the Graduate School (see page 10).

Students are admitted to graduate standing in agriculture who have had a thorough training in the sciences underlying agriculture, and who are otherwise eligible to the Graduate School, even though their undergraduate course of study lacked to some extent the amount and kind of technical work in agriculture included in the course of study for the bachelor's degree in agriculture at the University of Illinois.

AGRICULTURAL ECONOMICS

Graduate students in agricultural economics may do their work in the general field of agricultural economics or specialize in any one of the following: (1) farm organization and management; (2) land economics; (3) agricultural marketing; and (4) agricultural prices and statistics.

Graduate work in agricultural economics as a major subject is open to students under either of two conditions: (1) the student must have done at least 20 hours of undergraduate work in economics, agricultural economics, business organization and operation, accountancy, history, political science, or sociology, of which at least 12 hours must have been in the field of economics and agricultural economics; or (2) the student must have had a thorough training in the principles of agricultural economics consisting of at least 12 hours credit in economics and agricultural economics, either in connection with or in addition to a course of study in agriculture substantially equivalent to that required for the bachelor's degree in agriculture in this University.

To take agricultural economics as a minor, the student must have had at least 20 hours work in agricultural and economic subjects. Two units in agricultural economics will be accepted as satisfying this requirement.

Graduate students who are making agricultural economics their major are required to take at least one course in advanced economic theory. Where such students are taking two minors in other departments, one of them must be in economics, business organization and operation, accountancy, sociology, history, or political science.

Certain courses given in other departments are closely related to those in agricultural economics. A graduate student whose major is in agricultural economics may be permitted, on approval of the departments concerned, to take such courses as part of his major work. Attention is called to graduate courses in economics, accountancy, business organization and operation, and sociology, as well as those in other departments in the College of Agriculture.

Courses for Graduates

109. Seminar. Thesis Course.—All graduate students majoring in Agricultural Economics must register in Agricultural Economics 109; credit is conditional upon the completion of an acceptable thesis. Once a week; both semesters. *One to two units.* Members of the department.

110. Theory of Agricultural Economics.—Twice a week; both semesters. *One unit.* Professor Stewart.

111. Agricultural Prices and Statistics.—Twice a week; both semesters. *One unit.* Associate Professor Working.

112. Agricultural Economics Research.—Credit is conditional upon the completion of an acceptable report of investigation. Once a week; both semesters. *One to two units.* Members of the department.

120. Farm Management Principles and Investigational Methods.—Twice a week; both semesters. *One unit.* Professor Case.

135. Marketing Fruits and Vegetables.—Once a week; first semester. *One to two units.* Professor Lloyd.

Courses for Graduates and Advanced Undergraduates

10. Economic Relationships of Agriculture.—Three times a week; first semester. Professor Stewart.

11. Agricultural Prices and Statistics.—Three times a week; second semester. Associate Professor Working.

14. Cooperation in Agriculture.—Twice a week; second semester. Assistant Professor Bartlett.

15. Financing Agriculture.—Three time a week; second semester. Professor Norton.

17. Economic History of Agriculture.—Twice a week; first semester.

18. Land Economics.—Three times a week; second semester. Professor Stewart.

22. Types and Systems of Farming.—Required field trip, expense about $3. Three times a week; first semester. Associate Professor Wilcox.

23. Farm Business Analysis.—Required field trip, expense about $5. Three times a week; second semester. Mr. Wells.

24. Farm Operation.—Required field trip, expense about $3. Twice a week; first semester. Associate Professor Ross, Mr. Wills.

25. Farm Organization.—Required field trip, expense about $5. Three times a week; second semester. Associate Professor Wilcox, Mr. Ackerman.

26. Farm Administration.—Twice a week; first semester. Professor Case, Mr. Ackerman.

31. Grain Grading and Marketing.—Required inspection trip, expense about $15. Three times a week; second semester. Professor Pieper.

34. Marketing Dairy Products.—Twice a week; second semester. Assistant Professor Bartlett.

36. Marketing Horticultural Products.—For seniors and graduates specializing in horticulture. Inspection trip required; estimated cost, $12. Three times a week; first semester. Professor Lloyd.

37. Marketing Livestock.—Twice a week; second semester. Associate Professor Ashby.

42. Farm Appraisals.—Local field trips to be arranged; estimated cost, $5. Four times a week; second semester. Members of departments involved.

AGRONOMY

Graduate students may take work in agronomy leading to the M.S. and Ph.D. degrees. They may specialize for either degree in soil fertility, soil physics, soil biology, plant breeding, or crop production.

For either degree, if two minors are chosen, the first should be, and both first and second may be, taken in a department other than agronomy. If only one minor is chosen, it must be in a field outside of the department.

A candidate for the master's degree in agronomy must present an acceptable thesis, and show proficiency in his work as demonstrated by suitable examinations, prescribed by the department.

Fifteen college credits in agronomy and related subjects are prerequisites for a minor, and five additional credits are prerequisites for a major. Students must have had the fundamental work in science, prerequisite to the major and minor fields of study. Those with unusually good training in science may be permitted by the department to waive certain of the above mentioned requirements.

Courses for Graduates

101. Chemical Properties of Soils; Their Relation to Soil Development and Plant Growth.—Twice a week; first semester. *One unit.* Professor DeTurk.

104. Seminar.—Once a week; both semesters. *One-fourth unit.* The Graduate Staff.

112. Theory and Analysis of Plant Breeding Problems.—Three times a week; first semester. *One unit.* Professor Woodworth.

114. Principles Underlying the Production of Crops.—Twice a week; second semester. *One unit.* Professors Burlison, Dungan.

118. Research.—A special problem is chosen by each student. Graduate students writing theses should so indicate in registering in Agronomy 118. Both semesters. *One-half to four units.*

(a) Soils.—Professors Bauer, DeTurk, R. S. Smith.
(b) Crops.—Professors Burlison, Woodworth, Dungan.

119. Experiment Station Problems.—See Animal Husbandry 103.

Courses for Graduates and Advanced Undergraduates

107. Crop Production as Affected by Environmental Factors.—Three times a week; first semester. Professors Burlison, Dungan.

10. Genesis, Morphology, Classification, and Geography of Soils.—Three times a week; second semester. Professor R. S. Smith.

11. Rôle of Micro-organisms in Soil Fertility.—Three times a week; first semester. Associate Professor Sears.

13. Soil Productivity, its Variation, Modification, and Maintenance.—Three times a week; second semester. Professor Bauer.

22. Improvement of Farm Crops by Breeding.—Three times a week; second semester. Professor Woodworth, Dr. Bonnett.

29. Principles of Field Plot Experimentation.—Three times a week; first semester. (Given in 1936-37 and in alternate years.) Professor Woodworth, Mr. Mumm.

30. Metabolism of Soil Micro-organisms.—Three times a week; second semester. (Given in alternate years; not given in 1936-37.) Associate Professor Sears.

31. Biological Methods of Soil Investigation.—Three times a week; second semester. (Given in 1936-37 and in alternate years.) Associate Professor Sears.

32. Physical Methods of Soil Investigation.—Three times a week; first semester. (Given in 1936-37 and in alternate years.) Dr. Stauffer.

33. Chemical Methods of Soil Investigation.—Three times a week; first semester. (Given in alternate years; not given in 1936-37.) Professor DeTurk.

ANIMAL HUSBANDRY

The department of animal husbandry offers graduate work leading to the degree of Master of Science and the degree of Doctor of Philosophy. For a major or minor for the master's degree the student may specialize in the general field of animal production, or in the special fields of animal genetics, animal nutrition, animal pathology and poultry husbandry. For a major or minor for the doctor's degree he may specialize in animal genetics, the economics of meat production, animal nutrition, and animal pathology. Advanced work in poultry husbandry may be taken for a minor for the doctor's degree.

For registration for a minor in animal husbandry a student must offer at least 15 college credits in the field, including the principles of feeding, the principles of genetics, livestock production and livestock judging, and he must have had an introductory course in organic chemistry. For a major a student must offer at least 5 additional college credits in animal husbandry or in courses related to the major field of specialization. Besides these general requirements a student must have had the special training required for effective graduate study in the field of his chosen major: For work in animal production, the economics of meat production; for work in poultry husbandry, an introductory course in farm management; for work in animal genetics, at least an introductory course in general zoology; for work in animal nutrition, a satisfactory course in quantitative chemical analysis, and preferably also a course in animal physiology; for work in animal pathology, training in histology, physiology, bacteriology, and hygiene. Attention is also directed to the advisability of including in undergraduate preparation for graduate work in any phase of animal husbandry at least introductory training in French or German and in mathematics.

In the case of students with an unusually thorough training in science who wish to pursue graduate work in some special field of animal husbandry from a

non-agricultural viewpoint, the department may waive certain of the above requirements.

Students who desire to become candidates for the doctorate and who register for a minor in the general fields of animal production or the economics of meat production must take Animal Husbandry 7 and 41, if they have not taken these courses or their equivalents during their undergraduate training. Such students registering for a major in these general fields must take in addition Animal Husbandry 31, and most students so majoring will find it desirable to register in Animal Husbandry 35.

Courses for Graduates

103. Personnel Relationships in Teaching, Research, and Extension Work.—Organization and administration of research; objects, methods, and the sources of error in experimental work. Open to graduate students in all departments of the College of Agriculture. Once a week; second semester. *One-half unit.* Professor Mumford.

112. Research.—Investigations along the following lines:

(a) Economic Factors Involved in Meat Production.—Professors Rusk, Carroll.

(b) Systems of Livestock Farming.—Professor Case.

(c) Animal Pathology.—Professor Graham.

(d) Animal Nutrition.—The chemistry of feeding stuffs; metabolism experiments and biochemical studies connected with the nutrition of farm animals. Professor Mitchell.

(e) Animal Genetics.—Professor Roberts.

(f) Problems in Poultry Husbandry.—Professor Card.

One to three times a week; both semesters. *One-half to two units.* These courses may be taken during the summer by special permission.

117. Animal Genetics.—Two to three times a week; both semesters. *One unit.* Professor Roberts.

118. Animal Nutrition Seminar.—A review of current literature in animal nutrition. Two hours a week; both semesters. *One-half unit.* Professor Mitchell.

119. Laboratory Methods in Animal Nutrition.—Two to five times a week; both semesters. *One-half to one unit.* Professor Mitchell.

120. Laboratory Methods in the Diagnosis of Animal Diseases.—Two to five times a week; both semesters. *One-half to one unit.* Professor Graham.

121. Laboratory Methods in Animal Genetics.—Two to five times a week; both semesters. *One-half to one unit.* Professor Roberts.

Courses for Graduates and Advanced Undergraduates

7. Principles of Animal Nutrition.—Five times a week; first semester. Mr. Hamilton.

22. Advanced Stock Judging.—Five times a week; first semester. Members of the department.

24. Meat Judging and Special Problems.—Two to five times a week; first semester. Associate Professor Bull.

25. Beef Production.—Three times a week; first semester. Professor Rusk, Associate Professor Snapp.

26. Pork Production.—Three times a week; first semester. Professor Carroll.

27. Sheep Husbandry.—Three times a week; second semester. Associate Professor Kammlade.

28. History of Breeds of Livestock.—Three times a week; second semester. Professor Edmonds and other members of the department.

31. Advanced Course in Animal Nutrition.—Three times a week; second semester. Professor Mitchell.

33. Horse Production.—Three times a week; second semester. Professor Edmonds, Mr. Crawford.

35. Animal Hygiene and Sanitation.—Twice a week; second semester. Professor Graham, Dr. Johnson.

39. Poultry Breeding and Improvement.—Three times a week; first semester. Professor Card.

40. Economics of Poultry Keeping.—Three times a week; second semester. Professor Card.

41. Animal Genetics.—Three times a week; second semester. Professor Roberts.

ARCHITECTURE AND ARCHITECTURAL ENGINEERING

The prerequisite for graduate work in the Department of Architecture is the equivalent of the undergraduate courses required at the University of Illinois for the bachelor's degree in the department in the branches of the subjects in which registration is desired.

Courses for Graduates

101. Architectural Construction.—Theory and design. Twice a week; both semesters. *One-half to two units.* Professor Palmer.

103. Architectural Construction.—Special problems. Twice a week; both semesters. *One-half to two units.* Professor Morgan.

104. Architectural Design.—Advanced course. Twice a week; both semesters. *One to three units.* Professor Deam.

105. Architectural Practice.—Research in special topics. Once a week; both semesters. *One-fourth to one-half unit.* Professor Provine.

106. Architectural History.—Special research. Twice a week; both semesters. *One-half to two units.* Professor Newcomb.

ASTRONOMY

The prerequisites for graduate study in astronomy are mathematics through calculus, a year's course in descriptive astronomy, and a course in college physics.

Courses for Graduates

101. Seminar.—Three times a week; both semesters. *One unit.* Professor Baker.

103. Celestial Mechanics.—Three times a week; both semesters. *One unit.* Professor Baker.

Courses for Graduates and Advanced Undergraduates

9. Astrophysics.—Three times a week; second semester. Professor Baker.

15. Geodetic Astronomy.—Three times a week; first semester. Professor Baker.

BACTERIOLOGY

Students electing bacteriology as a major study must have had at least 10 semester hours of bacteriology and 15 semester hours of some other physical or biological science. Before receiving a degree a student must have had work equivalent to courses 20, 8, 26, 103, and 107; candidates for the doctor's degree will be held responsible for a general knowledge of the subject as applied to plant pathology, dairy husbandry (dairy bacteriology), and soil biology. Courses in these subjects are listed under their respective departments and will be counted, after conference with adviser, toward the requirements for the doctor's degree.

In addition to the usual examinations in courses, each candidate for the master's degree will be required to pass a general written examination toward the close of the second semester of residence.

Candidates for the doctor's degree with a major study in another field than bacteriology, who elect a first or second minor in bacteriology, must offer a minimum of three units for the first minor and two and one-half units for the second minor selected from the courses offered in this department, or, for satisfactory reasons, certain courses in the departments mentioned above. These courses must include course 103 and one advanced laboratory course in the department of bacteriology.

NOTE: The attention of students is called also to courses in bacteriology offered in other departments. Certain of these courses must be elected toward requirements for advanced degrees after conference with adviser.

Courses for Graduates

103. PHYSIOLOGY OF BACTERIA.—Twice a week; first semester. *One unit.* Professor TANNER.

107. RESEARCH.—For those students who are taking a major in bacteriology either for the doctor's degree or master's degree. Both semesters. *One-half to four units.* Professor TANNER, Assistant Professor WALLACE.

118a–118b. CURRENT LITERATURE.—Required of all graduate students majoring in bacteriology. Once a week; both semesters. *One-fourth unit.* Professor TANNER.

Courses for Graduates and Advanced Undergraduates

8. FOOD BACTERIOLOGY.—Water, sewage, and food bacteria. Five times a week; second semester. Professor TANNER, Dr. CLARK.

10. EPIDEMIOLOGY.—Twice a week; second semester. Assistant Professor WALLACE.

20. GENERAL BACTERIOLOGY.—For seniors and graduate students. Five times a week; first semester. Assistant Professor WALLACE.

26. PATHOGENIC BACTERIOLOGY AND IMMUNOLOGY.—Five times a week; first semester. Assistant Professor WALLACE.

BOTANY

Candidates for advanced degrees in botany must offer for admission at least 20 hours in botany inclusive of courses 2 or 12 and 3, or 15 hours in botany and 5 hours in a related subject acceptable to the department. Graduate students who elect botany for minor credit must offer 15 hours in botany, or 10 hours in botany and 5 hours in a related subject acceptable to the department.

The department wishes to call the attention of graduate students to courses in agronomy and soils, bacteriology, chemistry, entomology, geography, geology, horticulture, mathematics, physics, physiology, and zoology which are available to advanced students and offer a broad foundation for the different phases of botanical work. The practical work in plant sciences in the College of Agriculture and the Experiment Station offers unusual facilities to the graduate student. Joint majors may be arranged in botany and agronomy.

Courses for Graduates

110. Botanical Discussions.—Required of all graduate students and of members of the instructional staff. Once a week; both semesters. No credit
112. Discussions in Plant Morphology.—Once a week; both semesters. *One-fourth unit.* Professor Buchholz.
113. Discussions in Physiology.—Once a week; both semesters. *One-fourth unit.* Professor Hottes.
117. Discussions in Pathology and Mycology.—Once a week; both semesters. *One-fourth unit.* Professor N. E. Stevens.
118. Discussions in Plant Ecology and Plant Geography.—Once a week; both semesters. *One-fourth unit.* Associate Professor Vestal.

Research Courses

120. Morphology.—Once or twice a week; both semesters. *One-half to two units.* (Botany 112 to be taken concurrently.) Professor Buchholz.
130. Physiology.—Once or twice a week; both semesters. *One-half to two units.* (Botany 113 to be taken concurrently.) Professor Hottes.
170. Pathology or Mycology.—Once or twice a week; both semesters. *One-half to two units.* (Botany 117 to be taken concurrently.) Professor N. E. Stevens.
180. Plant Ecology or Plant Geography.—Once or twice a week; both semesters. *One-half to two units.* (Botany 118 to be taken concurrently.) Associate Professor Vestal.

Courses for Graduates and Advanced Undergraduates

20. Cytology.—One or twice a week; second semester. (Given in alternate years; not given in 1936-37.) Professor Buchholz.
33. Physiology.—Growth, and the effect of environment on growth. Once or twice a week; first semester. Professor Hottes.
34. Physiology.—Respiration, and the effects of the environment and food on energy release. Once or twice a week; second semester. Professor Hottes.
41. Algae and Bryophytes.—Morphology and classification. Once or twice a week; second semester. Dr. Hague.
43. Pteridophytes.—Comparative morphology. Once or twice a week; first semester. (Given in 1936-37 and in alternate years.) Professor Buchholz.
44. Spermatophytes.—Comparative morphology. Once or twice a week; second semester. (Given in 1936-37 and in alternate years.) Professor Buchholz.
45. Histology, Anatomy, and Technique.—Once or twice a week; first semester. Professor Buchholz.
46. Heredity and Evolution.—The cell in inheritance, environment, adaptation and evolution. Once or twice a week; first semester. (Given in alternate years; not given in 1936-37.) Professor Buchholz.

55. Plant Geography of North America.—Regional divisions; climate, soil, topography, vegetation, vegetational history. Once or twice a week; first semester. (Given in alternate years; not given in 1936-37.) Associate Professor Vestal.

56. Plant Geography.—Plants and vegetation of continents other than North America; geographic relations of floras. Once or twice a week; first semester. (Given in 1936-37 and in alternate years.) Associate Professor Vestal.

60. Systematic Botany.—Phylogenetic study of flowering plants. Relationship of the principal orders and families, rules of taxonomy and the identification of species. Once or twice a week; first semester. (Given in 1936-37 and in alternate years.) Dr. Fuller.

72. Mycology.—Structure, classification, and indentification of fungi, including those of economic importance. Once or twice a week; first semester. Professor N. E. Stevens.

79. Principles and Methods in Plant Pathology.—The isolation, culture, and identification of pathogenic fungi. Once or twice a week; second semester. Professor N. E. Stevens.

80. Ecology.—Analysis of the environmental complex; responses of plants to particular factors. Once or twice a week; second semester. (Given in alternate years; not given in 1936-37.) Associate Professor Vestal.

81. Plant Ecology.—Relation to environment and distribution of individual plants and of vegetation (communities). Once or twice a week; first semester. Associate Professor Vestal.

88. Ecology.—Plant communities. Characteristics, composition, and classes of vegetation-units. Once or twice a week; second semester. (Given in 1936-37 and in alternate years.) Associate Professor Vestal.

BUSINESS ORGANIZATION AND OPERATION
(Including Accountancy and Business Law)

ACCOUNTANCY

Accountancy may be taken as a major for the degree of Master of Science or Doctor of Philosophy. A student registering in accountancy as a major must have the equivalent of 15 university credits in accountancy and also at least one course each in principles of economics and finance. One desiring to pursue accountancy as a minor must present similar courses, with 12 instead of 15 credit hours in accountancy as a minimum. Accountancy 4a is a prerequisite for 104; 3b for 110; 13 for 113; and 20 for 120.

Courses for Graduates

103. Advanced Theory and History.—Twice a week; both semesters. *One unit.* Professor Littleton.

104. Accounting Systems.—Twice a week; both semesters. *One unit.* Professor Scovill.

113. Governmental Accounting.—Twice a week; second semester. *One unit.* Professor Morey.

120. Income Tax Development.—Twice a week; first semester. *One unit.* Professor Filbey.

129. Thesis.—Once a week; both semesters. *One unit.* Professor Littleton and members of the staff.

Courses for Graduates and Advanced Undergraduates

3a. Advanced Accounting.—Three times a week; either semester. Professors Filbey, Littleton.

3b. Auditing.—Three times a week; either semester. Professor Filbey.

4a. Cost Accounting.—Twice a week; either semester. Professor Schlatter.

4b. Accounting Systems.—Twice a week; either semester. Associate Professor Baily.

5a–5b. C.P.A. Problems.—Three times a week; both semesters. Professor Scovill.

13. Governmental Accounting.—Twice a week; either semester. Professor Morey, Assistant Professor Hackett.

20. Income Tax Procedure.—Twice a week; second semester. Professor Filbey.

30. Budgets and Accounting Control.—Three times a week; either semester. Associate Professor Theiss.

BUSINESS ORGANIZATION AND OPERATION

Work may be done in the field of business organization and operation for a major or a minor for the M.S. degree, and for a minor for the doctorate. To do major work in this field, the student must have completed an undergraduate curriculum equivalent to that of the College of Commerce and Business Administration. To do minor work, he must have had at least five semester hours' credit in the principles of economics, also Business Organization and Operation 1 and 2 or the equivalent. Business Organization and Operation 1 is a prerequisite for 104.

Courses for Graduates

102. Marketing Research and Policies.—Twice a week; both semesters. *One unit.* Professor Converse.

104. Scientific Management.—A study of modern management methods and procedures, particularly as they apply to industrial enterprises. Twice a week; both semesters. *One unit.* Professor Anderson.

107. Sales Campaigns.—Twice a week; both semesters. *One unit.* Professor Russell.

129. Thesis.—Time to be arranged; both semesters. *One unit.* Professor Russell and others.

Courses for Graduates and Advanced Undergraduates

3. Retail and Chain Store Organization and Operation.—Three times a week; second semester. Mr. Whitlo.

4. Management in Manufacturing.—Three times a week; first semester. Professor Anderson.

7. Salesmanship.—Twice a week; either semester. Dr. Jones.

8. Advertising.—Three times a week; either semester. Professor Russell.

9. Trade and Civic Organizations.—Twice a week; second semester. Dr. Bruce.

14. The Technique of Executive Control.—Three times a week; second semester. Professor Anderson.

17. Sales Management.—Twice a week; either semester. Mr. Heslip.

18. Advertising Campaigns.—Three times a week; second semester. Professor Russell.

20. Credits and Collections.—Three times a week; either semester. Dr. Huegy.

22. Marketing Research and Policies.—Twice a week; second semester. Professor Converse.

75. Management of Public Utilities.—Three times a week; first semester. (Not given in 1936-37.) Associate Professor Gray.

BUSINESS LAW

Course for Graduates and Advanced Undergraduates

10. Law of Security Relations and Banking.—Three times a week; either semester. Associate Professor Dillavou.

CERAMIC ENGINEERING

This department offers graduate work leading to the degrees of Master of Science in Ceramics, Master of Science in Ceramic Engineering, Doctor of Philosophy in Chemistry (Ceramic Chemistry), and Doctor of Philosophy in Engineering.

The prerequisite for majoring in graduate work in ceramics or ceramic engineering is proficiency in the undergraduate courses required for the degree of Bachelor of Science in the branch of the subject in which registration is desired, or substantial equivalents.

Candidates for the degree of Doctor of Philosophy in Chemistry (Ceramic Chemistry) must have had the equivalent of at least 25 semester hours of satisfactory courses in general, analytical, physical, and organic chemistry; also calculus, one year of college physics, one semester of optical mineralogy, and at least 18 semester hours or their equivalent in acceptable ceramic courses.

Courses for Graduates

101a-101b. The Chemistry of the Compounds of Silicon.—Twice a week; both semesters. *One unit.* Professor Parmelee.

102. General Technology of the Clay Industries.—Twice a week; both semesters. *One to two units.*

(a) Ceramic Materials and Processes.—Professor Parmelee.

(b) Drying and Firing Processes.—Professor Hursh.

(c) Enamels and Equilibrium Studies.—Professor Andrews.

103. Chemistry of Silicates.—Laboratory to supplement Ceramic Engineering 101, which must precede or accompany it. Both semesters. *One to two units.* Professor Parmelee.

104. Technology of Glass.—Twice a week; second semester. *One to two units.* Professor Parmelee.

105. Methods of Ceramic Research.—Twice a week; second semester. *One unit.* Professor Parmelee.

106. Research.—Professors Parmelee, Hursh, Andrews.

Courses for Graduates and Advanced Undergraduates

5. Ceramic Bodies.—Five times a week; first semester. Professor Parmelee.

7. Structural Clay Products.—Three times a week; first semester. Professor Andrews.

8. Glass Technology.—Twice a week; second semester. Professor Parmelee.

10. Cements.—Twice a week; second semester. Professor Andrews.
11. Drying Clay Products.—Three times a week; second semester. Professor Hursh.
14. Glasses and Glazes.—Three times a week; second semester. Professor Parmelee.
16. Enamels.—Three times a week; second semester. Professor Andrews.
17. Enamel Laboratory.—Three times a week; first semester. Professor Andrews.
18. Ceramic Microscopy.—Three times a week; first semester. Mr. Thompson.
20. Refractory Materials.—Twice a week; second semester. Professor Andrews.
22. Kilns and the Burning of Clay Products.—Three times a week; first semester. Professor Hursh.
23. Dryer and Kiln Design.—Twice a week; first semester. Professor Hursh.
24. Ceramic Engineering Design.—Three times a week; second semester. Professor Hursh.
28. Pyrochemical Problems.—Twice a week; second semester. Professor Andrews.

CHEMISTRY

(Including Chemical Engineering)

Graduate students whose major subject is in some department other than chemistry, before taking graduate work for credit in this department, must have had the equivalent of 15 university credits in chemistry, and the ground covered should include satisfactory work in general chemistry and in qualitative and quantitative analysis and elementary organic chemistry. Such students are advised to make selections from the following courses: Chemistry 40, 41, 42, 43, 27, 36b and 37b, 50a, 60a, 15a, 16a and 29b. Courses of a more special nature will not as a rule be accepted for graduate work unless preceded by one of the courses above. Graduate students who are candidates for an advanced degree in chemistry or chemical engineering must have had the equivalent of 25 university credits in chemistry properly distributed.

Graduate students whose major subject is in some department other than chemistry and who intend to take a first minor in chemistry or any branch of chemistry toward the Ph.D. degree must include among the courses taken, Chemistry 40 and 41, or must have had the equivalent.

Graduate students who are candidates for the A.M. or M.S. degree in chemistry must include in the courses taken Chemistry 40 and 41 or must have had the equivalent. Graduate students who are candidates for the Ph.D. degree in any branch of chemistry or chemical engineering must include among their courses Chemistry 40, 41, 42, and 43 or must have had the equivalent.

Students who intend to take graduate work in chemistry or chemical engineering should include in their undergraduate preparation at least the equivalent of one full year of physics, one year of French, one year of German, and mathematics through differential and integral calculus. Any student without these subjects may enter the Graduate School but will be required to spend part of his time in residence on the above-mentioned subjects.

Candidates for the degree of Ph.D. in chemical engineering must have completed an undergraduate training in chemical engineering comparable to that offered in the chemical engineering curriculum at the University of Illinois.

Courses for Graduates

Inorganic Chemistry

101a–101b. Inorganic Chemistry.—The less familiar elements and their relationship in the periodic system. Lectures; recitations. Twice a week; both semesters. *One-half unit.* Professor Hopkins.

102a–102b. Inorganic Chemistry.—(Laboratory.) Inorganic preparations and qualitative analysis of the less familiar elements. To accompany or follow Chemistry 101a–101b. One to three times a week; both semesters. *One-fourth to three-fourths unit.* Professor Hopkins.

105a-105b. Inorganic Chemistry.—(Seminar.) Current literature; (Required of all students whose major is in inorganic chemistry.) Once a week; both semesters. *One-fourth unit.* Professor Hopkins.

106a. Inorganic Chemistry.—Special topic: Non-aqueous solvents as media for chemical reactions. Twice a week; first semester. *Three-fourths unit.* Assistant Professor Audrieth.

106b. Inorganic Chemistry.—Special topic to be announced. Twice a week; second semester. *Three-fourths unit.*

Qualitative and Quantitative Analysis

123a. Qualitative Analysis.—The principles and methods of analytical chemistry; theory of solutions. Lectures. Twice a week; first semester. *One-half unit.* Associate Professor Reedy.

123c. Qualitative Analysis.—Laboratory work, optional, to accompany Chemistry 123a. Special topic: Microanalysis. One to three times a week; first semester. *One-fourth to three-fourths unit.* Associate Professor Reedy.

124b. Quantitative Analysis.—A modern survey of advanced principles, calculations, experimental methods and applications. Lectures. Twice a week; second semester. *One-half unit.* Associate Professor Reedy.

124d. Quantitative Analysis.—Laboratory work, optional, to accompany Chemistry 124b. One to three times a week; second semester. *One-fourth to three-fourths unit.* Associate Professor Smith.

125a-125b. Analytical Chemistry.—(Seminar.) Special topics in analytical chemistry. (Required of all students taking a major or minor in analytical chemistry.) One to three times a week; both semesters. *One-fourth to one unit.* Professor Clark.

126a. Quantitative Instrumental and Chemical Methods of Analysis in Chemical Research.—(Ultimate bomb analysis, gas density, polarimetry, refractometry, spectrophotometry, colorimetry, microscopy, etc.) Lectures. Twice a week; first semester. *One-half unit.* Associate Professor Englis.

126c. Quantitative Instrumental and Chemical Methods of Analysis in Chemical Research.—Laboratory work, optional, to accompany Chemistry 126a. One to three times a week; first semester. *One-fourth to three-fourths unit.* Associate Professor Englis.

127a–127b. Applied X-rays.—Lectures. Twice a week; both semesters. *One-half unit.* Professor Clark.

127c–127d. Applied X-rays.—Laboratory, optional, to accompany Chemistry 127a–127b. One to three times a week; both semesters. *One-fourth to one-half unit.* Professor Clark.

Organic Chemistry

132a. Organic Chemistry.—(First course.) Review of the general reactions in organic chemistry. Problems. Twice a week; first semester. *Three-fourths unit.* Professor Shriner.

133b. Organic Chemistry.—Optical isomerism; geometric isomerism; tautomerism, etc. Twice a week; second semester. *Three-fourths unit.* Professor Adams.

134. Organic Chemistry.—(Laboratory.) Advanced preparations are selected to meet the needs of each individual in the course. Two to four times a week; both semesters. *One-half to one unit.* Professors Marvel, Shriner.

135a–135b. Organic Chemistry.—(Seminar.) Current literature. (Required of all students majoring in organic chemistry.) Once a week; both semesters. *One-fourth unit.* Professor Adams.

136a. Organic Chemistry.—Special topics. Twice a week; first semester. *Three-fourths unit.* Professor Marvel.

Physical Chemistry

145a–145b. Physical Chemistry.—(Seminar.) Recent development in physical chemistry. Twice a week; both semesters. *Three-fourths unit.* Professor Rodebush and staff.

Biochemistry

150b. Biochemistry.—Chemistry of intermediary metabolism. Lectures; discussions; readings. Twice a week; second semester. *Three-fourths unit.* Professor Rose.

152a-152b. Biochemistry.—Difficult biochemical preparations; chiefly laboratory. One to five times a week; both semesters. *One-half to one unit.* Professor Rose.

155a-155b. Biochemistry.—(Seminar.) Current literature. (Required of all students whose major is in biochemistry.) Twice a week; both semesters. *Three-fourths unit.* Professor Rose.

Chemical Engineering

160a-160b. Advanced Chemical Engineering.—Advanced work on unit operations and processes. Lectures. Twice a week; both semesters. *One-half unit.* Professor Keyes.

161a–161b. Chemical Plant Design.—Calculations and layout of equipment for recently developed processes. Twice a week; both semesters. *One-half unit.*

Sanitary Chemistry

185a-185b. Chemistry of Water Treatment.—(Seminar.) Special problems and new developments in sanitary chemistry. Twice a week; both semesters. *One-half to one and one-fourth units.* Professor Buswell.

Miscellaneous

190a–190b. Research.—A thesis is usually required of students taking the master's degree and is always required of students taking the degree of Doctor of Philosophy. Both semesters. Work may be taken in the following subjects:

Physical and Electrochemistry.—Professor Rodebush, Associate Professor Phipps, Assistant Professor Copley.

Inorganic Chemistry.—Professor Hopkins, Associate Professor Reedy, Assistant Professors Audrieth, Bailar, Copley.

Analytical Chemistry.—Professor Clark, Associate Professors Reedy, Smith, Englis.

Applied X-rays.—Professor Clark.

Food Chemistry.—Associate Professor Englis.

PHYTO-CHEMISTRY.—Associate Professor ENGLIS.

ORGANIC CHEMISTRY.—Professors ADAMS, MARVEL, FUSON, SHRINER, Assistant Professor BAILAR.

SANITARY CHEMISTRY.—Professor BUSWELL.

ZYMO-CHEMISTRY.—Professor BUSWELL.

BIOCHEMISTRY.—Professor ROSE.

CHEMICAL ENGINEERING.—Professor KEYES, Associate Professor JOHNSTONE.

CERAMIC CHEMISTRY.—Professor PARMELEE.

192a. CHEMICAL LITERATURE AND REFERENCE WORK.—Once a week; first semester. *One-fourth unit.* Dr. BARTOW.

Courses for Graduates and Advanced Undergraduates

Inorganic Chemistry

15a. INORGANIC CHEMISTRY.—The common elements; periodic relationship; preparation and application of the common elements and compounds. Lectures; recitations. Twice a week; first semester. Assistant Professor COPLEY.

16a. INORGANIC Chemistry.—(Laboratory.) Preparation of the less easily produced inorganic compounds. Twice a week; first semester. Assistant Professor COPLEY.

Qualitative and Quantitative Analysis

27. SPECIAL METHODS AND INSTRUMENTS IN QUANTITATIVE ANALYSIS.—Three times a week; both semesters. Associate Professor SMITH.

29b. FOOD ANALYSIS.—Quantitative organic analysis of food products; alcohols, carbohydrates, fats and oils, cereals, nitrogenous bodies, preservatives, and colors. Six times a week; second semester. Associate Professor ENGLIS.

Organic Chemistry

36b. ORGANIC CHEMISTRY.—(Second course.) Three times a week; second semester. Professor MARVEL.

37b. ORGANIC CHEMISTRY.—(Laboratory.) (Second course.) Organic synthesis. To accompany Chemistry 36b. Twice a week; second semester. Professor FUSON.

38a. QUALITATIVE ORGANIC ANALYSIS.—Identification of pure organic compounds and mixtures. Twice a week; first semester. Professor FUSON.

Physical Chemistry

40. ELEMENTARY PHYSICAL CHEMISTRY.—Three times a week; both semesters. Professor RODEBUSH, Associate Professor PHIPPS.

41. ELEMENTARY PHYSICAL CHEMISTRY.—(Laboratory.) To accompany Chemistry 40. Once a week; both semesters. Professor RODEBUSH, Associate Professor PHIPPS and assistants.

42. ELEMENTARY PHYSICAL CHEMISTRY.—Three times a week; both semesters. Associate Professor PHIPPS.

43. ELEMENTARY PHYSICAL CHEMISTRY.—(Laboratory.) Once a week; both semesters. Associate Professor PHIPPS and assistants.

44a–44b. ADVANCED PHYSICAL CHEMISTRY.—Thermodynamics and free energy calculations. Atomic structure. Twice a week; both semesters. Professor RODEBUSH, Associate Professor PHIPPS.

49b. CHEMISTRY OF COLLOIDS.—Lectures and demonstrations. Preparation and properties of colloids. Special apparatus and technique employed in colloid chemistry. Three times a week; second semester. Professor BUSWELL and assistant.

Biochemistry

50a. Biochemistry.—Proteins, fats, and carbohydrates; tissues, digestion, intestinal putrefaction, and feces; quantitative analysis of gastric contents, blood, milk, and urine. Lectures; laboratory. Five times a week; first semester. Professor Rose, Dr. Carter, and assistants.

51b. Problems of Metabolism.—Micro-methods of blood and urine analysis, and their application. Lectures; laboratory. Three times a week; second semester. Dr. Carter and assistants.

Chemical Engineering

60a. Chemical Technology.—The survey of important unit processes and recent developments in the chemical industry; optional inspection trip. (Estimated cost of this trip is $15 to $20 per student.) Laboratory. Four times a week; first semester. Associate Professor Johnstone.

61a.–61b. Principles of Chemical Engineering.—The application of scientific principles to the unit operations of chemical engineering. Lectures; laboratory. Four times a week; both semesters. Associate Professor Johnstone.

62a. Principles of Research and Development.—The fundamental methods used in research and development in chemical industry. Twice a week; first semester. Professor Keyes.

62b. Economics of Chemical Engineering.—Economic principles applied to chemical industry. Twice a week; second semester. Professor Keyes.

63b. Introduction to Chemical Engineering.—Three times a week; second semester.

64b. High Pressure Reactions.—Processes and calculations. Twice a week; second semester.

65b. Chemical Engineering Calculations.—Three times a week; second semester. Associate Professor Johnstone.

71a. Sampling, Grinding, and Mixing.—Principles and calculations. Once a week; first semester.

73a. Metallurgy.—Manufacture of iron and steel. Three times a week; first semester.

74b. Metallurgy and Metallography.—General metallurgy of iron and steel; physical characteristics and microstructure of metals and alloys. Lectures; laboratory. Three times a week; second semester. Mr. Howard.

Sanitary Chemistry

86a. Chemistry of Water Treatment.—Lectures, demonstrations, field trips. Methods for determining water quality. Special water requirements of industries. Chemistry of water conditioning for municipal and industrial use. By-product recovery from industrial and other wastes. Three times a week; first semester. Professor Buswell.

Miscellaneous

92a. Chemical Literature and Reference Work.—Once a week; first semester. Dr. Bartow.

95a. History of Science with Particular Reference to Chemistry.—Lectures; reading. Twice a week; first semester. Dr. Bartow.

CIVIL ENGINEERING

The prerequisite for graduate work in civil engineering is the equivalent of the undergraduate course required for the degree of Bachelor of Science in civil engineering in the branches of the subject in which registration is desired.

Courses open to junior and senior students are open for minor credit to students majoring in other departments.

See also Theoretical and Applied Mechanics and Railway Engineering.

Courses for Graduates

101. Water Supply.—Design, pumping machinery, administration, operation. Twice a week; first semester. *One unit.* Professor Babbitt.

102. Sewerage.—General sewerage design and construction, sewerage systems, hydraulics of sewers. Twice a week; second semester. *One unit.* Professor Babbitt.

103. Highway Engineering.—Highway transportation, airport design, street layouts, regional plans, and pavements for cities. Twice a week; first semester. *One unit.* Professor Crandell.

104. Municipal Engineering.—City finances and budgets, the work of the city manager and city engineer, zoning, play grounds and parks, street cleaning; smoke prevention, and fire prevention. Twice a week; second semester. *One unit.* Professor Crandell.

105. Reinforced Concrete Design.—Theories of action of beams, slabs and columns of reinforced concrete. Codes and specifications and their influence on design. Effect of continuity. Twice a week; second semester. *One unit.* Professors Cross, Shedd.

106. Structural Theory and Design.—General theory of continuity. Moment distribution. The column analogy. Rigid frame bridges and buildings. Fixed and continuous arches. Classification of structures from viewpoint of design. Twice a week; first semester. *One or two units.* Professor Cross.

107. Steel Design.—Design of steel members. Codes and specifications for buildings. Riveted and welded connections. Evolution of bridge specifications. Loads and working stresses. Economic proportions. Twice a week; first semester. *One unit.* Professors Cross, Shedd.

108. Structural Theory and Design.—Statically indeterminate trusses. Continuous trusses. Steel arches. Secondary stresses. Suspension bridges. Long span roofs. Skeleton steel buildings. Twice a week; second semester. *One or two units.* Professor Cross.

109. Water Purification and General Sanitation.—Design of water purification works and principles of sanitation. Twice a week; first semester. *One unit.* Professor Babbitt.

110. Sewage Disposal, Wastes Disposal, and General Sanitation.—Principles and design of sewage treatment and waste disposal works. Twice a week; second semester. *One unit.* Professor Babbitt.

112. Masonry Construction.—Design and construction of dams, retaining walls, abutments and piers, culverts, grain elevators, and bins. Twice a week; first semester. *One-half to one and one-half units.* Professor Huntington.

113. Foundations.—Investigation of sites, soil mechanics, spread footings, pile foundations, cofferdams, deep foundations. Once a week; second semester. *One-half to one unit.* Professor Huntington.

120. Highway Traffic, Transport, and Safety.—Traffic growth, characteristics, surveys, regulations, and signaling. Private and commercial transportation by automobile, bus, and truck. Transport organization and regulation. Accident surveys, analysis, and prevention. Once a week; second semester. *One unit.* Associate Professor Wiley.

130. Hydrology.—Precipitation, evaporation, transpiration, run-off, stream flow regulation, flood control. Twice a week; first or second semester. *One unit.* Professor Pickels.

131. Water Power.—Preliminary investigations, selection of site, storage requirements, structures, machinery, etc. Twice a week; second semester. *One unit.* Professor Doland.

140. Special Problems.—Individual investigations of various phases of civil engineering. First or second semester. *One-half to two units.* Members of the department.

198. Thesis.—First or second semester. *One to two and one-half units.* Members of the department.

Courses for Graduates and Advanced Undergraduates

67-68. Statically Indeterminate Structures.—The elastic theory and its applications in statically indeterminate structures. Three times a week; both semesters. Professor Cross.

THE CLASSICS

The Degree of Master of Arts in the Classics.—The major may be either Latin or Greek.

The Degree of Doctor of Philosophy in the Classics.—The degree is given in classical philology. Major work may be taken in either Latin or Greek, but whichever language is taken as a major, the other must be taken as a first minor.

GREEK

Preparation for first-year graduate work in Greek should include at least two years of preparatory Greek, two years of college Greek, and two years of college Latin. A reading knowledge of French and German is important for candidates in this subject. The study of history and philosophy is especially recommended.

Courses for Graduates

105. Plato, The Republic.—Twice a week; first semester. *One unit.* Professor Oldfather.

110. Bibliography and Criticism.—(Thesis course; the same as Latin 110.) Once a week; both semesters. *One unit.* Professors Oldfather, Canter, Associate Professor Perry.

121. Thucydides.—Twice a week; second semester. *One unit.* Associate Professor Perry.

Courses for Graduates and Advanced Undergraduates

5. Herodotus and the Lyric Poets.—Three times a week; first semester. Associate Professor Perry.

8. Greek Drama: Tragedy and Comedy.—Three times a week; second semester. Associate Professor Perry.

18. Greek Archaeology.—Twice a week; first semester.

LATIN

Preparation for first-year graduate work in Latin should include at least two years of preparatory Latin and four years of college Latin. A reading knowledge of French and German is important. Some acquaintance with Greek is highly desirable, and the study of history and philosophy is especially recommended.

Courses for Graduates

106. Terence.—Twice a week; second semester. *One unit.* Professor Oldfather.

107. Latin Epigraphy.—Twice a week; second semester. *One unit.* Professor Canter.

110. Bibliography and Criticism.—(Thesis course; the same as Greek 110.) Once a week; both semesters. *One unit.* Professors Oldfather, Canter, Associate Professor Perry.

116. Latin Satire.—Twice a week; first semester. *One unit.* Professor Canter.

118. The Latin Romance.—Twice a week; first semester. *One unit.* Associate Professor Perry.

Courses for Graduates and Advanced Undergraduates

10. Composition.—Twice a week; second semester. Associate Professor Perry.

18. Roman Archaeology.—Twice a week; second semester.

23. Livy, Tibullus, and Propertius.—Three times a week; first semester. Professor Canter.

24. Ovid (*Elegy*) and Seneca (*Epistles and Tragedies*).—Three times a week; second semester. Professor Canter.

DAIRY HUSBANDRY

A graduate student may elect dairy husbandry as his major subject for the degree of Master of Science or Doctor of Philosophy.

For either degree a first minor must be taken outside the department, preferably outside the college. If a second minor is elected it may with proper approval be chosen in the department.

Candidates for advanced degrees in dairy husbandry must have had adequate training in collegiate courses in dairy husbandry. In addition, depending upon his field of specialization, the student should have had courses in the following subjects: chemistry, bacteriology, physics, economics, zoology, genetics, and mathematics.

Courses for Graduates

101. Economic Milk Production.—Twice a week; both semesters. *One-half to two units.* Professor Fraser.

105. Dairy Manufactures.—Both semesters. *One-half to two units.* Professor Ruehe, Associate Professor Tracy.

106. Dairy Bacteriology.—Research on assigned problems. Both semesters. *One-half to two units.* Professor Prucha.

107. Dairy Chemistry.—Assigned problems. Both semesters. *One-half to two units.* Associate Professor Overman.

108. Physiology of Lactation.—Both semesters. *One-half to two units.* Professor Gaines.

112. Research.—Graduate students writing theses should so indicate in registering in Dairy Husbandry 112. Both semesters. *One to four units.* Special problems along the following lines:

(a) Dairy Bacteriology.—Professor Prucha.

(b) Dairy Chemistry.—Associate Professor Overman.

(c) Dairy Cattle Breeding.—Professor Yapp.

(d) Dairy Cattle Feeding.—Professor Nevens.

(e) Milk Production.—Professor Gaines.

(f) Dairy Manufactures.—Professor Ruehe, Associate Professor Tracy.

113. Seminar.—Current literature in dairy bacteriology, dairy chemistry and dairy manufactures. Once a week; both semesters. *One-half unit.* Members of the Graduate Staff.

114. Seminar.—Current literature in biology of milk production. Once a week; both semesters. *One-half unit.* Professor Gaines.

Courses for Graduates and Advanced Undergraduates

4. Ice Cream Making.—Four times a week; first semester. Associate Professor Tracy.

5. Composition of Dairy Products.—Three times a week; second semester. Associate Professor Overman.

7. Creamery Buttermaking and Factory Management.—Five times a week; second semester. Professor Ruehe, Mr. Tuckey.

8. Fluid Milk Plant Operations.—Three times a week; second semester. Associate Professor Tracy.

10. Advanced Dairy Bacteriology.—Three times a week; first semester. Professor Prucha, Assistant Professor Brannon.

14. Milk Condensing.—Three times a week; second semester. Associate Professor Tracy.

17. Advanced Study of Dairy Breeds.—Three times a week; first semester. Professor Yapp.

20. Economic Problems in Dairy Farming.—Three times a week; first semester. Professor Fraser.

21. Systems of Dairy Farming.—Three times a week; second semester. Professor Fraser.

25. Advanced Dairy Cattle Feeding.—Twice a week; first semester. Professor Nevens.

ECONOMICS

Every student entering on major graduate work in economics must have had a course in the principles of the science and also in some special part of the field such as public finance or money and banking. The work must represent at least eight semester hours. He must have had at least one semester's work in English, American, or general European history, and at least three hours in political science.

Those who take the subject as a minor must have had a course of at least five semester hours in the principles alone, or in the principles and some other course for which this is a prerequisite.

Graduate students who are making economics their major are required during their first year to acquaint themselves with the works of the masters in the science, by taking either course 101 or 103. In the same or subsequent year they are expected to elect the fundamental courses in some other divisions of the field of economics. One of the minors for the doctor's degree may be taken in a separate division of economics; the other must be taken out of the department, and preferably outside of the College of Commerce.

The following courses may be taken by students in general economics for major or minor credit; all numbered above 100; 4, 10, 11, 24, 25, 29, 30, 31, 41, 42, 43, 44, 51, 52, 55, 61, 65, 71, 72, 81, 89, 92, 99. The following may be taken for minor credit only: 8, 9, 31, 36, 56, 82, 83, 93, 96.

Two units will be accepted for a first minor for the master's degree; and four two- or three-hour graduate courses, or their equivalent in advanced undergraduate courses, for a first minor for the doctor's degree.

Courses in agricultural economics, accountancy, and business organization and operation may be used to satisfy the requirements for the minor. See Business Organization and Operation, and Agricultural Economics.

Courses for Graduates

101. Economic Theory.—Twice a week; both semesters. *One unit.*

102. Theory and History of Money, Credit, and Prices.—Twice a week; both semesters. *One unit.* Dr. Lounsbury.

103. The Distribution of Wealth.—Twice a week; both semesters. *One unit.*

104a. Theories and Policies of International Trade.—Twice a week; first semester. *One unit.* Professor Litman.

104b. Organization of International Trade.—Twice a week; second semester. *One unit.* Professor Litman.

105. Public Finance.—Twice a week; both semesters. *One unit.* Professor Hunter.

106. International Exchange and the Money Markets.—Twice a week; second semester. *One unit.* Professor Wright.

107. The Corporation in Economic Evolution.—Twice a week; both semesters. *One unit.*

109. Comparison of the Theory and Practice of the Leading Central and Reserve Banks with Special Reference to England, Germany, France, and the United States.—Twice a week; first semester. *One unit.* Professor Wright.

110a. Finance and Investments: Fundamental Principles Applied to Business Units of a Simple Character.—Twice a week; both semesters. *One unit.* Assistant Professor Brown.

112. Labor Problems.—Twice a week; both semesters. *One unit.* Associate Professor Berman.

This course is arranged in a two-year cycle:

1936-37: Labor Problems; Trade Unionism; both semesters. (Not given in the first semester of 1936-37.)

1937-38: Wages and Unemployment, first semester; Labor and the Law, second semester.

118. Seminar.—Thesis course. (All graduate students writing theses in economics must register in Economics 118; registration for other students is optional.)

(a) Third Year: Seminar.—Professor Litman.
(b) First Year: General Economics.—Assistant Professor Brown.
(d) First Year: Public Utilities.—Associate Professor Gray.

120. History of Economic Thought.—Twice a week; both semesters. *One unit.*

122. Economic History of the United States.—Twice a week; both semesters. *One unit.* Professor Bogart.

123. Industrial and Financial Organization of Society.—Twice a week; both semesters. *One unit.* Professor Lee.

124. International Economics and Finance.—Twice a week; both semesters. *One unit.* Professor Bogart.

143. The Administration of Industrial Relations.—Twice a week; both semesters. *One unit.* Dr. Helbing.

144. Business Cycles.—Twice a week; both semesters. *One unit.* Assistant Professor Dickinson.

180. Management of Public Utilities.—Twice a week; both semesters. *One unit.* Associate Professor Gray.

192. Economics of Transportation.—Twice a week; both semesters. *One unit.* Associate Professor Locklin.

See also Mathematics 129.—Theory of Statistics.

Courses for Graduates and Advanced Undergraduates

4. History of Money and Banking Institutions, with Particular Reference to the United States.—Three times a week; second semester. Professor Lee.

8. Foreign Exchange and the Money Market.—Three times a week; second semester. Professor Wright.

9. Advanced Theory and Practice of Banking.—Three times a week; first semester. Professor Wright.

10. Corporation Finance and Management.—Three times a week; either semester. Associate Professor Gray and others.

11. Industrial Consolidation. — Development; plans for controlling trusts. Three times a week; first semester. Assistant Professor Brown.

23. Economic Problems.—Three times a week; first semester. Professor Lee.

24. Economic Development of Modern Europe.—Three times a week; second semester. Professor Bogart.

25. Economic History of England.—Three times a week; first semester. Professor Bogart.

28. Ocean Shipping.—Three times a week; first semester. Professor Litman.

29. International Commerce and Commercial Policies.—Three times a week; second semester. Professor Litman.

30. World Markets.—Three times a week; second semester. Professor Litman.

31. Organization of International Commerce.—Three times a week; first semester. Professor Litman.

36. Investments.—Three times a week; second semester. Assistant Professor Brown.

41. Labor Problems.—Three times a week; first semester.

42. Trade Unionism.—Three times a week; second semester.

43. Personnel Administration.—Three times a week; second semester. Dr. Helbing.

44. Socialism and Economic Reform.—Three times a week; either semester. Dr. Helbing.

51. Public Finance.—Three times a week; either semester. Professor Hunter.

52. Problems in Taxation, with Special Reference to Illinois.—Three times a week; second semester. Professor Hunter.

55. Economics of Insurance (Life).—Three times a week; first semester. Assistant Professor Dickinson.

56. Economics of Insurance (Property).—Three times a week; second semester. Assistant Professor Dickinson.

58. Urban Land Economics.—Three times a week; first semester. (Not given in 1936-37.) Assistant Professor Dickinson.

61. Economic Theory.—Three times a week; both semesters.

71. Economic Statistics.—Three times a week; first semester. Assistant Professor Dickinson.

72. Economic Statistics (Business Barometers).—Three times a week; second semester. Assistant Professor Dickinson.

81. Principles of Public Utilities.—Three times a week; first semester. Associate Professor Gray.

82. Regulation of Public Utilities.—Twice a week; second semester. Associate Professor Dillavou.

83. Public Utility Rates.—Three times a week; second semester. Associate Professor Gray.

93. Industrial Traffic Management.—Three times a week; second semester. Associate Professor Locklin.

94. Railroad Operation.—Three times a week; second semester. (Not given in 1936-37.)

95. Railroad Rates.—Three times a week; first semester. Associate Professor Locklin.

96. Transportation Problems.—Three times a week; second semester. Associate Professor Locklin.

97. Railroad Finance.—Three times a week; second semester. Associate Professor Locklin.

98. Railroad Organization.—Twice a week; first semester. (Not given in 1936-37.)

EDUCATION

In addition to complying with the general rules of the Graduate School, candidates for the master's degree in education must meet the following requirements: (1) Education 125 is a required course for all students; (2) for students who have not taken a course in the history of education, Education 11 or Education 30 is required; (3) Education 6 and 25, or their equivalents, are prerequisites for all graduate courses.

No student is recommended to the Dean of the Graduate School for formal admission to candidacy for the master's degree until at least four units of the eight ordinarily required for the degree have been completed satisfactorily. In the case of a student who has been allowed to waive the thesis (see page 13) two papers will be required. The first shall be written during the first half of the student's residence and shall be an important factor in determining his further status in the department. The second shall be written during the second half of the student's period of residence.

Courses for Graduates

101. Philosophy of Education.—Twice a week; second semester. *One unit.* Professor Cameron.

102. Research in History of American Education.—Once a week; two hours; both semesters. *One unit.* Professor Seybolt.

104. Educational Administration.—Twice a week; both semesters. *One unit.* Associate Professor Weber.

106. High School Administration.—Once a week; two hours; first semester. *One unit.* Professor Clement.

119. Trends and Techniques in Curriculum Making.—Once a week; two hours; both semesters. *One unit.* (Not given in 1936-37.)

120a. Supervision of Secondary Education.—Once a week; two hours; second semester. *One unit.* Professor Clement.

121. Educational Measurement.—Once a week; two hours; second semester. *One unit.* Associate Professor Odell.

123. Educational Statistics.—Once a week; two hours; first semester. *One unit.* Associate Professor Odell.

124. Readings in Educational Research.—Once a week; two hours; both semesters. *One unit.* Professor Monroe.

125. Educational Psychology.—Once a week; two hours; both semesters. *One unit.* Professor Cameron.

127. High-School Curricula.—Once a week; two hours; first semester. *One unit.* Professor Clement.

128. Junior High School.—Twice a week; first semester. *One unit.* (Not given in 1936-37.) Professor Clement.

129. The Junior College.—Once a week; two hours; second semester. *One unit.* Professor Clement.

131. Analysis and Evaluation of High School Texts.—Once a week; two hours; second semester. *One unit.* Professor Clement.

139. Seminar in Curriculum Problems.—Once a week; two hours; both semesters. *One unit.* (Not given in 1936-37.)

147. Psychology of Elementary School Subjects.—Once a week; two hours; first semester. *One unit.* Professor Cameron.

148. Psychology of High School Subjects.—Once a week; second semester. *One unit.* Professor Cameron.

150. Thesis.—Both semesters. *One or two units.* Dean Benner and others.

170. Public School Finance and Business Administration.—Once a week; two hours; first semester. *One unit.* Associate Professor Weber.

184. Seminar in School Administration.—Once a week; two hours; second semester. *One unit.* Associate Professor Weber.

185. Seminar in Educational Psychology.—Once a week; two hours; both semesters. *One unit.* Professors Cameron, Griffith.

186. Seminar in Secondary Education.—Once a week; two hours; first semester. *One unit.* Professor Clement.

187. Seminar in Industrial Education and Guidance.—Once a week; two hours; first semester. *One unit.* Professor Mays.

190. Seminar in Educational Research.—Once a week; two hours; second semester. *One unit.* Dean Benner and others.

Courses for Graduates and Advanced Undergraduates

11. Ancient and Medieval Education.—Twice a week; first semester. Professor Seybolt.

15. Mental Hygiene in the School.—Three times a week; first semester. Professor Griffith.

18. Educational Measurements.—Three times a week; both semesters. Associate Professor Odell.

21. Supervision of Elementary Education.—Three times a week; first semester. Assistant Professor Browne.

30. History of American Education.—Twice a week; second semester. Professor Seybolt.

31. Introduction to Modern Theories in Education.—Three times a week; second semester. Assistant Professor Browne.

41. Vocational Education.—Three times a week; second semester. Professor Mays.

42. Special Education.—Twice a week; first semester. Assistant Professor Dolch.

43. Mental Tests.—Three times a week; second semester. Assistant Professor Potthoff.

45. Genetic Psychology for Teachers.—Three times a week; second semester. Professor Griffith.

46. Recent Developments in the Teaching of Elementary School Subjects.—Three times a week; first semester. Assistant Professor Dolch.

50. Psychology of the Pre-School Child.—Three times a week; second semester. (Not given in 1936-37.) Professor Griffith.

52. Part-Time and Evening Schools.—Twice a week; first semester. Professor Mays.

53. Problems of Industrial Education.—Three times a week; both semesters. Professor Mays.

55. Problems of Vocational Guidance.—Three times a week; second semester. Professor Mays.

ELECTRICAL ENGINEERING

The prerequisite for graduate work in electrical engineering is the equivalent of the undergraduate courses required for the degree of Bachelor of Science in electrical engineering in the branches of the subject in which registration is desired.

Graduate students who wish to take a minor in electrical engineering must have had differential and integral calculus, and one year's work in college physics.

Courses offered to junior and senior students in electrical engineering are open for minor credit to students majoring in other departments who have the proper prerequisites.

Courses for Graduates

101. Advanced Courses in Alternating Currents.—Both semesters. *One-half to two units:*
(a) Graduate Seminar.—Professor Paine.
(b) Circuit Transients.—Professor Knight.
(c) Machine Transients.—Assistant Professor Keener.
(d) Symmetrical Components.—Assistant Professor Kraehenbuehl.

102. Electric Waves, Oscillations, and Transients.—Both semesters. *One-half to two units:*
(a) Theory of Electric Waves, Oscillations, and Transients.—Associate Professor Reich.
(b) Demonstration Lectures.—Associate Professor Reich.
(c) Theory of Energy Radiation.—Assistant Professor Brown.
(d) Principles of Television Engineering.—Assistant Professor Brown.

103. Electrical Design.—Both semesters. *One unit:*
(a) Power Plant Design.—Professor Paine.
(b) Machine Design.—Professor Paine.
(c) Illumination Practice and Design.—Assistant Professor Kraehenbuehl.

104. Electronics.—Both semesters. *One unit:*
(a) Theoretical Electronics.—Associate Professor Reich.
(b) Vacuum Tubes and Amplifiers.—Associate Professor Reich.
(c) Photoelectric Cells, Gaseous Control Tubes, and Inverters.—Associate Professor Reich.

105. Electrical Engineering Research.—Both semesters. *One to three units.* Professors Paine, Tykociner, Knight; Associate Professor Reich; Assistant Professors Brown, Keener, Kraehenbuehl.

ENGLISH LANGUAGE AND LITERATURE

Students who enter on graduate work with English as their major subject are required to give evidence of their ability to write good English. They must present the equivalent of fourteen hours of undergraduate work in English literature, the required college work in rhetoric, and the equivalent of four semesters of college work in Latin, or in Greek, or in French, or in German. After the first year of graduate work a knowledge of French and German is indispensable.

Students making English their minor may be admitted to such courses as in the judgment of the instructor in charge they are qualified to pursue.

The Degree of Master of Arts in English.—In addition to complying with the general rules of the Graduate School, candidates for the degree of Master of Arts in English must comply with the following rules of the Department of English: (1) They must choose a portion of their work from the group of courses described as "for graduates"; (2) must offer an elementary course in Anglo-Saxon; and (3) must pass a general examination.

The Degree of Doctor of Philosophy in English.—Candidates for the degree of Doctor of Philosophy in English may expect to be examined on the entire field of the English language and literature. They are urged, furthermore, to acquaint themselves as fully as possible with the history and philosophy of the period in which their main interest lies, and with the foreign languages and literature most closely related to English and that period.

Courses for Graduates

101. Research in Special Topics.—*One to two units.* Professors Bernbaum, Flom, Paul, Zeitlin, T. W. Baldwin, Graham, E. C. Baldwin, Jones, Hillebrand, Jefferson; Associate Professors Parry, Fletcher, Secord; Assistant Professors Rinaker, Finney.

111. Caedmon and Cynewulf.—Twice a week; first semester. *One unit.* Professor Jones.

114. The Development of the Essay.—The English essay; classical origins; continental influences. Twice a week; both semesters. *One unit.* Professor Zeitlin.

128. Literature of the Sixteenth Century.—Twice a week; both semesters. *One unit.* (Not given in 1936-37.) Professor Jones.

129. English Literature from the Norman Conquest to 1400.—Twice a week; both semesters. *One unit.* Professor Jones.

130. Tragedy.—Twice a week; both semesters. *One unit.* Professor Hillebrand.

135. Problems in American Literature.—Twice a week; both semesters. *One unit.* Professor Paul.

137. Prose Writers of the Nineteenth Century.—Twice a week; both semesters. *One unit.* (Not given in 1936-37.) Professor Zeitlin.

138. The Romantic Movement.—Twice a week; both semesters. *One unit.* (To receive credit, a student must take both semesters.) Professor Bernbaum.

140. Investigations in Modern English Literature.—(For second-year and third-year graduate students who are preparing theses for the doctor's degree.) Once a week; three hours; both semesters. *One to three units.* (May be taken in successive years.) Professor Bernbaum.

141. Literature of the Seventeenth Century.—Twice a week; second semester. *One unit.* Professor E. C. Baldwin.

143. History and Theory of Prose Fiction.—Once a week; two hours; both semesters. *One unit.* (To receive credit, a student must take both semesters.) Professor Bernbaum.

145. English Literature in the Eighteenth Century.—Once a week; two hours; both semesters. *One unit.* Professor Graham.

146. The Text of Milton.—Twice a week; first semester. *One unit.* Associate Professor Fletcher.

147. Shakespeare and Elizabethan Drama.—Critical study of the chief plays. Twice a week; both semesters. *One unit.* Professor T. W. Baldwin.

148. Seminar in the Elizabethan Drama.—Twice a week; second semester. *One unit.* Professor T. W. Baldwin.

149. Development of Tudor Drama.—Twice a week; both semesters. *One unit.* (Not given in 1936-37.) Professor T. W. Baldwin.

Courses for Graduates and Advanced Undergraduates

3. Poetry of Milton.—Three times a week; second semester. Professor E. C. Baldwin.

8. Old English (Anglo-Saxon).—Three times a week; first semester. Professor Flom.

9. Beowulf.—Three times a week; second semester. Professor Jones.

17. History of the English Language.—Three times a week; second semester. Professor Flom.

25. Chaucer.—Three times a week; first semester. Professor Jones.

26. Spenser.—Three times a week; second semester. Professor Jones.

34. Dr. Johnson and His Circle.—Three times a week; first semester. Assistant Professor Rinaker.

35. The English Drama (Previous to Shakespeare).—Three times a week; first semester. Professor T. W. Baldwin.

36. The English Drama (Exclusive of Shakespeare) from 1600 to 1700.—Three times a week; second semester. Professor Hillebrand.

38. The Arthurian Tradition.—Three times a week; second semester. Associate Professor Parry.

54a–54b. Introduction to Comparative Literature.—Three times a week; both semesters. Professors Bernbaum, Aron, Carnahan, Oldfather, Van Horne; Associate Professors Parry, Hamilton, Landis; Dr. Busey.

55a–55b. Survey of English Literature.—Three times a week; both semesters. Associate Professor Parry, Assistant Professor Finney.

SCANDINAVIAN LANGUAGES

Preparation for major graduate work in the Scandinavian languages or literature must include a good knowledge of one of the Scandinavian languages and systematic work in the undergraduate courses in Scandinavian. Any graduate student in language may, however, be admitted to course 101.

Courses for Graduates

101. Old Norse.—Introduction to the language; grammar; reading of the Prose Edda in part, and selections from the sagas. Twice a week; both semesters. *One unit.* Professor Flom.

102. Old Danish.—Introduction to the language; study of texts. Twice a week; first semester. *One unit.* Professor Flom.

103. Old Swedish.—Introduction to the language; study of texts. Twice a week; second semester. *One unit.* Professor Flom.

110. Old Norse Poetry (Advanced Old Norse).—Critical study of the *Poetic Edda.* Twice a week; both semesters. *One unit.* (Not given in 1936-37.) Professor Flom.

130. The Runic Inscriptions: Old Scandinavian, Anglo-Saxon, Gothic, and German.—Twice a week; second semester. *One unit.* (Not given in 1936-37.) Professor Flom.

150. Research.—Thesis; special problems in Scandinavian philology and modern Scandinavian literature. Once a week; both semesters. *One-half to two units.* Professor Flom.

ENTOMOLOGY

The prerequisite for graduate work in entomology is two years of undergraduate biology, including zoology and entomology. Entrance on major work in entomology requires at least six hours of entomology. A reading knowledge of French and German is desirable by the beginning of the second year.

Courses for Graduates

100. Research.—Once or twice a week; both semesters. *One-half to four units.*
   (a) Morphology and Embryology of Insects. Associate Professor Hayes.
   (b) Economic Entomology. Professor Metcalf.
   (c) Systematic Entomology. Professor Metcalf, Assistant Professor Balduf.
   (d) Biology and Ecology of Insects. Professor Metcalf.

107. Insect Anatomy.—Lectures and laboratory. Three times a week; both semesters. *One unit.* (Given in 1936-37 and in alternate years.) Associate Professor Hayes.

Courses for Graduates and Advanced Undergraduates

6. Special Problems.—Once or twice a week; both semesters. Various instructors.

8c. Pests of Man and Domestic Animals.—Lectures and laboratory. Three times a week; second semester. (Given in alternate years; not given in 1936-37.) Professor Metcalf.

10. Morphology and Taxonomy of Immature Insects.—Lectures and laboratory. Three times a week; both semesters. (Given in alternate years; not given in 1936-37.) Associate Professor Hayes.

20. Insect Control.—Lectures and laboratory. Three times a week; first semester. Professor Metcalf.

21. Insect Bionomics.—Lectures and readings. Three times a week; second semester. (Given in 1936-37 and in alternate years.) Professor Metcalf.

GENETICS

Those desiring a general training in genetics may take a major or minor in botany or zoology. Those desiring to approach agricultural problems through

genetics may take a major or minor in agronomy, horticulture, or animal husbandry. For courses in the subject see departments of Agronomy, Animal Husbandry, Botany, Horticulture, and Zoology.

GEOLOGY AND GEOGRAPHY

For graduate work in geology the student must usually have had at least a major in geology and an acceptable field training. The following undergraduate courses are recommended: Geology 2, 20, 9, 16, 15, 24, and 49. Graduate students in other departments may nevertheless be admitted to certain graduate courses in geology.

For graduate work in geography the student must have had at least the equivalent of a major in geography.

GEOLOGY

Courses for Graduates

102. Igneous Petrography.—Lectures; laboratory. Twice a week; both semesters. *One unit.* Professor Quirke.

122. Mountain and Continental Structures.—A study of the structure and dynamics of mountain ranges and of other areas having interesting structural problems. Three times a week; second semester. *One unit.* (Given in alternate years; not given in 1936-37.) Associate Professor Shepard.

125. Sedimentation.—The interpretation of sedimentary rocks in terms of their origin. Twice a week; first semester. *One unit.* (Given in 1936-37 and in alternate years.) Assistant Professor Wanless.

134. Advanced Studies in Geology.—Studies in petrography, crystallography, metamorphism, pre-Cambrian geology, ore deposition, advanced paleontology, micropaleontology, geophysical prospecting, and other subjects, to be arranged with members of the department. *One-half to four units.*

135. Research.—Once a week; both semesters. *One-half to four units.* Members of the department.

142. Paleozoic Stratigraphic Paleontology.—The invertebrate index fossils of the successive geologic formations. Three times a week; first semester. *One unit.* Assistant Professor Sutton.

143. Post-Paleozoic Stratigraphic Paleontology.—Stratigraphic study of the formations with a consideration of characteristic fossils. Three times a week; second semester. *One unit.* Assistant Professor Sutton.

151. Advanced Dynamic Geology.—A critical analysis of geologic processes and their results; the materials and structure of the earth; problems of geologic interpretations. Three times a week; first semester. *One unit.* (Given in 1936-37 and in alternate years.) Associate Professor Shepard.

152. Advanced Historical Geology.—Cosmogeny; the record of diastrophism; the development of the continents and oceans; the relationship between oceanic fluctuations and organic differentiation and evolution; physiographic, climatic, and organic history. Three times a week; first semester. *One unit.* (Given in alternate years; not given in 1936-37.) Assistant Professor Sutton.

160. Petroleum Geology.—Twice a week; both semesters. *One unit.* (Given in 1936-37 and in alternate years.) Associate Professor Howard.

163. Geologic Development of the Continents.—The paleography of continents other than North America, together with an outline of the geology of these continents as described in foreign geological literature. Three times a week; both semesters. *One unit.* (Given in alternate years; not given in 1936-37.) Associate Professor Howard.

Courses for Graduates and Advanced Undergraduates

9. Invertebrate Paleontology.—Fossil groups in biological sequence. Three times a week; first semester. Assistant Professor Sutton.

15. Structural Geology.—Rock deformation and its results. Three times a week; first semester. (Given in alternate years; not given in 1936-37.) Associate Professor Shepard.

16. Stratigraphy.—Fossil faunas, with special reference to Paleozoic invertebrates, correlation, and stratigraphy. Three times a week; second semester. Assistant Professor Sutton.

24. Field Methods and Mapping.—Once a week and three or four one-day field trips and one longer field trip. (Given in alternate years; not given in 1936-37.) Assistant Professor Wanless.

38. Regional Geology of the United States.—The characteristics of individual geologic provinces. Three times a week; first semester. (Given in alternate years; not given in 1936-37.) Associate Professor Howard.

49. Microscopic Mineralogy.—Five times a week; second semester. Professor Quirke.

60a-60b. Introduction to Research.—Two or four times a week; both semesters. Members of the department.

61a-61b. Applied Petroleum Geology.—Primarily for students in the College of Engineering. Three times a week; both semesters. Associate Professor Howard.

95. Economic Geology.—The nature, occurrence, origin, and uses of coal, oil, building stones, and bedded deposits of economic importance. Three times a week; first semester. (Given in alternate years; not given in 1936-37.) Professor DeWolf.

96. Economic Geology.—The nature, occurrence, and origin of metalliferous deposits; theories of ore deposition. Three times a week; second semester. (Given in alternate years; not given in 1936-37.) Professor Quirke.

GEOGRAPHY

Courses for Graduates

134. Advanced Studies in Geography.—Studies in geographical subjects. *One-half to four units.* Professor Blanchard, Assistant Professor Page.

135. Research.—Once a week; both semesters. *One-half to four units.* Professor Blanchard, Assistant Professor Page.

Courses for Graduates and Advanced Undergraduates

8. Geography of Europe.—Three times a week; first semester. Professor Blanchard.

10. Geography of Africa.—Three times a week; second semester. (Given in alternate years; not given in 1936-37.) Assistant Professor Page.

11. Geography of Asia.—Three times a week; second semester. Dr. Poggi.

14a. Climate of the Continents.—Three times a week; second semester. (Given in 1936-37 and in alternate years.) Assistant Professor Page.

53a. Production of the Great World Staples.—Three times a week; first semester. Professor Blanchard.

53b. Geographical Aspects of World Transportation.—Three times a week; second semester. Professor Blanchard.

60a–60b. Introduction to Research.—Two or four times a week; both semesters. Members of the department.

GERMAN

Students desiring to take German as a major are required to have finished successfully a four-year course of undergraduate work in German, or its equivalent. They are also required to be familiar with the principal works of the writers of the classical and modern periods of German literature, to show a general knowledge of the history of German literature, and to be able to follow lectures in the German language.

Of collateral subjects, a reading knowledge of French is important and is required for advanced graduate work. Some acquaintance with Latin and with German history is highly desirable.

Courses for Graduates

101. Seminar in Modern German Drama.—Twice a week; both semesters. *One unit.* Professor Aron.

Note.—Course 101 is arranged in a three-year rotation: Seminar in the German Novel, 1937-38; Seminar in Goethe and Schiller, 1938-39. Course S101 is arranged in a two-year rotation: Seminar in the German Lyric, Summer of 1936, Professor Aron; Seminar in Volkskunde with Special Reference to the Volkslied, Summer of 1937, Professor Williams.

102. Thesis.—Both semesters. *One-half to two units.* Professors Aron, Brooks, Williams; Assistant Professor Geissendoerfer.

104. Gothic.—Grammar and literature. Twice a week; first semester. *One unit.* Professor Williams.

105. Old High German.—Grammar and interpretation of the oldest literary documents. Twice a week; second semester. *One unit.* Professor Williams.

110. Early German Drama.—German drama up to the Reformation. Twice a week; second semester. *One unit.* (Alternates with course 32; not given in 1936-37.) Professor Brooks.

113. German Literature of the Fifteenth and Sixteenth Centuries.—Twice a week; first semester. *One unit.* Professor Brooks.

117. German Literature of the Seventeenth and Eighteenth Centuries.—Twice a week; both semesters. *One unit.* (Given in alternate years.) Professor Aron.

121. Walther von der Vogelweide.—Twice a week; second semester. *One unit.* (Alternates with course 121a.) Professor Williams.

121a. The Nibelungenlied.—Twice a week; second semester. *One unit.* (Alternates with course 121; not given in 1936-37.) Professor Williams.

Courses for Graduates and Advanced Undergraduates

119a–119b. Goethe's Faust.—The Faust legend and early Faust books and plays; the genesis of Goethe's *Faust;* reading of both parts. Twice a week; both semesters. Professor Brooks.

125a. German Literature up to 1800.—Three times a week; first semester. Professor Aron.

26b. German Literature since 1800.—Three times a week; second semester. Professor Aron.

31. Middle High German.—Twice a week; first semester. Professor Williams.

32. History of German Civilization.—Three times a week; second semester. (Alternates with course 110.) Professor Brooks.

HISTORY

Graduate work in history requires two years of college work in this subject, or sixteen semester hours, which should ordinarily include introductory courses in European and American history. Linguistic preparation is important, especially in French and German. For medieval history some knowledge of Latin is essential and Spanish is useful for certain fields of American history.

Advanced courses in history at the University of Illinois are of three kinds: (1) Courses for information and guidance in general reading. (2) Instruction in methodology, historiography, and bibliography. A part of this work (in course 103) is required of all graduate students in history during their first year. (3) Seminar courses for the study of special fields with a view primarily to training in the methods of historical criticism and research.

Illinois Historical Survey.—Students of history have an opportunity to pursue research in western history in connection with the Illinois Historical Survey, which is an organization for the purpose of carrying on systematic studies in the history of Illinois.

Attention is also called to the fact that the University of Illinois has for some time coöperated with the Trustees of the State Historical Library in the gathering and editing of archive material. As a result of this relation instructors and graduate students in the department have contributed from time to time to the publications of the Library and have been given useful training in the study of manuscript as well as of printed material.

Higher Degrees in History.—The following statement regarding the specific requirements for higher degrees in history is subject to the general requirements of the Graduate School.

Master of Arts

In addition to meeting the usual tests in the specific courses taken, each candidate for this degree will ordinarily be required to pass a general written examination early in the year and toward the close of the second semester an examination, also written, in two of the following fields: ancient history; medieval history of continental Europe; modern history of continental Europe; English history; American history; Latin-American history. The candidates are expected to have a general knowledge of historical method (see course 103). The department further requires a working knowledge of one important foreign language, ordinarily French or German.

Doctor of Philosophy

Major Requirements.—A candidate who selects history as his major subject may offer himself for examination in any four of the fields indicated below, stating also the particular field among these four in which he wishes to specialize and in which his thesis is to be written:

1. Ancient history. 2. Medieval history and institutions of continental Europe, to the close of the thirteenth century. 3. Continental Europe from 1300 to 1648. 4. Continental Europe and its dependencies since 1648 (except as included in 5 and 6). 5. The history of England and its dependencies (not including America before 1783). 6. The history of the United States. 7. The history of Latin America. This enumeration of fields is not to be regarded as excluding the possibility of accepting others as may be determined by the department in individual cases.

Minor Subjects.—A candidate for the doctorate in history may select as his first minor one of the divisions of the field of history listed above which is not offered as a part of his major. He should preferably, however, select his minors from subjects offered by other departments. The following list of suitable minors is intended to be suggestive rather than exhaustive or compulsory.

Political Science.—(Any two acceptable for a first minor; any one, for a second minor.) 1. International law and diplomacy. 2. Modern government. 3. Municipal government. 4. Constitutional and administrative law and jurisprudence. 5. Political theory.

Economics and Sociology.—(Any two acceptable for a first minor; any one, for a second minor.) 1. Economic history. 2. Economic theory. 3. Public and private finance. 4. Social reform. 5. Principles of sociology.

Philosophy and Education.—(Any two acceptable for a first minor; any one, for a second minor.) 1. History of ancient and medieval philosophy. 2. History of modern philosophy. 3. History of education.

Literature.—Some division of the history of literature which may be either comparative literature of a limited period or the literature of a particular country for a more extended period as may be agreed upon in each case.

Courses for Graduates

101. Seminar in American History.—Once a week; two hours; both semesters. *One unit.* Semester I: Introduction to research in American history. Professor Robertson. Semester II: Guidance in the investigation of selected topics. Professor Randall.

102. Seminar in English History.—A study of selected topics in the early modern period. Arrange hours; both semesters. *One unit.* Professor Dietz.

103. Historiography and Historical Method.—Required of all candidates for an advanced degree in history who do not present evidence of similar training elsewhere. Twice a week; first semester. *One unit.* Professor Randall.

104. Seminar in European History.—Once a week; two hours; second semester. *One unit.* Professor Lybyer.

105. Research in Special Topics.—Guidance in writing theses for advanced degrees. *One to two units.* Professors Larson, Lybyer, Robertson, Pease, Jones, Randall, Dietz, Hansen; Associate Professors Swain, Rodkey; Assistant Professors Dunbar, Ronalds, Werner.

106. Seminar in the History of the Later Middle Ages.—Arrange hours; both semesters. *One unit.* Professor Larson.

122. History of the West.—An intensive study of the westward movement, 1748-1778. Twice a week; both semesters. *One unit.* Professor Pease.

126. Spain in Europe and America, 1750-1870.—Bibliography, historiography, and topical reports. Arrange hours; first semester. *One unit.* Professor Robertson.

127. Inter-American Relations.—Relations of the Latin-American nations with each other and with the United States. The Monroe Doctrine, intervention, etc. Arrange hours; second semester. *One unit.* Professor Robertson.

133. Studies in the History of Europe in the Nineteenth Century.—Once a week; two hours; both semesters. *One unit.* Associate Professor Rodkey.

138. History of France in the Sixteenth and Seventeenth Centuries.—Twice a week; both semesters. *One unit.* Professor Jones.

150. Seminar in Ancient History.—Problems in the relations of East and West. Arrange hours; both semesters. *One unit.* Associate Professor Swain.

Courses for Graduates and Advanced Undergraduates

16a–16b. The American Colonies in the Eighteenth Century and the Beginnings of National Life and Organization.—Three times a week; both semesters. Assistant Professor Dunbar.

17a–17b. Social and Economic Forces in the United States in the Nineteenth Century.—Three times a week; both semesters. Professor Hansen.

19a–19b. History of American Immigration.—Twice a week; both semesters. Professor Hansen.

20a–20b. History of the South.—Twice a week; both semesters. Professor Randall.

21. History of the United States since 1877.—Twice a week; first semester. Professor Robertson.

22a.–22b. History of the West, 1634-1830.—Twice a week; both semesters. Professor Pease.

25. The Civil War and the Reconstruction.—Three times a week; first semester. Professor Randall.

26. History of the Latin-American Colonies.—Three times a week; first semester. Professor Robertson.

27. History of Latin America from the Wars of Independence to the Present Time.—Three times a week; second semester. Professor Robertson.

29. America and Europe, 1776-1870.—Foundations of international intercourse, with particular reference to the Latin-American colonies and states. Three times a week; second semester. Professor Robertson.

32a–32b. History of Europe, since 1878.—Three times a week; both semesters. Professor Lybyer, Associate Professor Rodkey.

36a-36b. History of the German People in Modern Times.—Three times a week; both semesters. (Not given in first semester of 1936-37.) Associate Professor Rodkey.

38a–38b. Development of the French Monarchy in the Later Middle Ages and in Early Modern Times, 1285-1648.—Three times a week; both semesters. Professor Jones.

39a–39b. The Renaissance and the Protestant and Catholic Reformations.—The transition from medieval to modern ideals. Three times a week; both semesters. (Not given in 1936-37.) Professor Jones.

44a–44b. Constitutional History of England.—Three times a week; both semesters. Professor Larson.

46a-46b. Social and Economic History of England, 1750-1936.—Three times a week; both semesters. Professor Dietz.

47a–47b. History of England in the Later Middle Ages and in the Early Modern Period, 1399-1603.—Three times a week; both semesters. (Not given in 1936-37.) Professor Dietz.

55. History of the Ancient Greek States.—Three times a week; first semester. Professor Oldfather.

56. History of the Roman Republic.—Three times a week; second semester. Professor Oldfather.

57a–57b. Ancient Imperialism, Hellenistic and Roman.—Three times a week; both semesters. Associate Professor Swain.

60. The United States in the World War.—Three times a week; second semester. Professor Randall.

62a–62b. Political and Constitutional Development of the United States.—Three times a week; both semesters. Professor Randall.

HOME ECONOMICS

As preparation for graduate work with a major in foods and nutrition the student must have had at least the equivalent of the foods and nutrition required in the undergraduate curriculum for the general major in home economics and, in addition, 3-5 hours in foods, dietetics, and nutrition; also quantitative chemical analysis.

As preparation for graduate work with a major in general home economics a student must have had the equivalent of the undergraduate curriculum for the general major in home economics, including a course in the principles of economics.

In addition to graduate courses in home economics the student will offer, for a major in foods and nutrition, either Chemistry 50a or 40 and 41, and for the general major, further courses in education, economics, or sociology.

Graduate students who choose home economics as a minor for the degree of Doctor of Philosophy must have had adequate preliminary preparation in foods and nutrition and must include among the courses to be taken for the minor either Home Economics 41 and 103 or 35 and 105, or must have had their equivalent. Of the courses open to advanced undergraduates, selection may be made from courses 20, 33, 35, 39a, 39b, and 41.

Courses for Graduates

101. Home Economics.—Twice a week; both semesters. *One unit.*

102. Research in Nutrition.—Both semesters. *One-half to three units.* Associate Professor Outhouse.

103. Nutrition Seminar.—Once a week; both semesters. *One-half unit.* Associate Professor Outhouse.

104. Research in Foods.—Both semesters. One-half to three units. Professor Woodruff.

105. Foods Seminar.—Once a week; both semesters. *One-half unit.* Professor Woodruff.

Courses for Graduates and Advanced Undergraduates

20. Physical Growth and Nutrition.—Twice a week; first semester. Associate Professor Outhouse.

28. Organization and Management of the Home.—Twice a week; second semester.

31. Clothing.—Three times a week; second semester. Assistant Professor Whitlock.

33. Diet in Disease.—Three times a week; second semester. Assistant Professor Barto.

35. Problems in Foods.—Three times a week; both semesters. Professor Woodruff.

39a-39b. Readings in Food and Nutrition.—Once a week; both semesters. Professor Woodruff; Associate Professor Outhouse; Assistant Professor Barto.

41. Problems in Nutrition.—Three to five times a week; second semester. Associate Professor Outhouse.

43a–43b. Problems in Textiles and Clothing.—Three times a week; both semesters. Assistant Professors Jacobsen, Whitlock; Miss Eades.

45. Organization and Teaching of Nutrition Classes.—Twice a week; second semester. Assistant Professor Barto.

48. Institution Dietaries and Administration.—Three times a week; second semester. Assistant Professor Smith.

50. Costume Design.—Twice a week; second semester. Miss Eades.

51. Textiles.—Three times a week; second semester. Assistant Professor Jacobsen.

56. The Child and His Development.—Twice a week; second semester. Assistant Professor Walls.

57a-57b. Problems in Home Management.—Three times a week; both semesters.

62. Food and Nutrition.—Three times a week; first semester. Associate Professor Outhouse; Dr. Hathaway.

HORTICULTURE

Graduate work is offered in the Department of Horticulture leading to the M.S. and Ph.D. degrees. Candidates may specialize for either degree in floriculture, olericulture, or pomology.

Twenty hours of collegiate work in horticulture and allied subjects are required for entrance upon major work, and twelve hours for minor work.

Courses for Graduates

103. Olericulture.—Once a week; both semesters. *One to two units.* Professor Lloyd.

105. Marketing Fruits and Vegetables.—See Agricultural Economics 135.

106. Olericulture Seminar.—Once a week; first semester. *One-fourth unit.* Professor Lloyd.

108. Pomology.—Three times a week; both semesters. *One to four units.*
(a) Pomological Problems.—Professor Blair.
(b) Pomology and Fruit Breeding.—Professor Dorsey.
(c) Pomological Physiology.—Professor Ruth.
(d) Small Fruits.—Professor Colby.
(e) Pomological Pathology.—Professor Anderson.

115. Floriculture.—Once a week; both semesters. *One to two units.*
(a) Floricultural Problems.—Professor Dorner.
(b) Floricultural Physiology and Pathology.—Associate Professor Weinard.

120. Pomology Seminar.—Once a week; both semesters. *One-fourth unit.* Professors Dorsey, Ruth, Anderson.

125. Fruit Development.—Three times a week; first semester. *One unit.* Professor Dorsey.

130. Physiology of Fruit Production.—Three times a week; first semester. *One unit.* Professor Ruth.

135. Fruit Disease Research.—Three times a week; first semester. *One unit.* Professor Anderson.

140. Advanced Small Fruit Culture.—Three times a week; second semester. *One unit.* Professor Colby.

Courses for Graduates and Advanced Undergraduates

212. Evolution of Horticultural Plants.—History, classification, and distribution of cultivated plants; modification under culture; variation; methods. Three times a week; first semester. Professor Dorsey.

243. Greenhouse Fertilizers.—Three times a week; first semester. Associate Professor Weinard.

244. Current Pomological Literature.—For seniors and graduates specializing in pomology. Once a week; both semesters. Professor Ruth.

245. Plant Nutrition.—Three times a week; second semester. Associate Professor Weinard.

246. Marketing Horticultural Products.—See Agricultural Economics 36.

247. Fruit Storage.—The effects of environment upon fruits. The storage of fruits. Three times a week; first semester. Professor Ruth.

251. Fruit Diseases.—Three times a week; second semester. Professor Anderson.

LIBRARY SCIENCE

Before beginning work for the master's degree in library science students ust have completed at least thirty semester hours' work in library science this institution or in an approved institution.

Students desiring to prepare for work in special types of libraries will be pected to include at least one unit of advanced courses in appropriate subjects her than library science. All such changes in the program of the student must approved by the Director of the Library School.

Graduate students working toward the master's degree with a major in rary science must complete the thesis within three years after first registra- n therein, unless there is approval of a longer period based upon unusual ntingencies.

Courses for Graduates

101. THESIS.—*One to two units.* Professor WINDSOR and others.

102. SEMINAR.—Both semesters. *One-half to three units.*
(a) TECHNIQUES OF THE STUDY OF READING INTERESTS.—(Not given in 1936-37.)
(b) COLLEGE AND UNIVERSITY LIBRARY ADMINISTRATION.—Once a week; two hours; second semester. *One unit.* Professor WINDSOR.
(c) PUBLISHERS.—Once a week; two hours; first semester. *One unit.* Associate Professor BOYD.
(d) SPECIAL LIBRARIES.—
(e) INDIVIDUAL PROBLEMS.—*One-half to one unit.* Professor WINDSOR and others.

103a-103b. ADVANCED REFERENCE.—Twice a week; both semesters. *One half unit each semester.* Miss HIGGINS.

104a-104b. ADVANCED CATALOGING AND CLASSIFICATION.—Once a week; two hours; both semesters. *One-half unit each semester.* Associate Professor BOND.

Courses for Graduates and Advanced Undergraduates

7. HISTORY OF LIBRARIES.—Twice a week; second semester. Miss SINGLETON.

9. HISTORY OF BOOKS AND PRINTING.—Twice a week; second semester. Professor WINDSOR.

13a. GOVERNMENT PUBLICATIONS.—Production, distribution, and use as reference material of United States federal publications. Twice a week; first semester. Miss HIGGINS.

24a–24b. BOOK SELECTION FOR SPECIAL GROUPS.—Twice a week; both semesters. Assistant Professor HOSTETTER.

42. GOVERNMENT PUBLICATIONS.—The use as reference material of American, state, and municipal documents, and of publications of foreign governments. Three times a week; second semester. Miss HIGGINS.

44. BOOKBUYING FOR THE LARGE LIBRARY.—Twice a week; first semester. Miss GARVER.

45. LIBRARY BUILDINGS AND EQUIPMENT.—Twice a week; first semester.

46. HIGH SCHOOL LIBRARY ADMINISTRATION.—Three times a week; second semester. Assistant Professor HOSTETTER.

48. LIBRARY ADMINISTRATION.—Special problems. Problem for 1937: Publicity Twice a week; second semester.

49. CHILDREN'S LITERATURE.—Twice a week; second semester. Assistant Professor HOSTETTER.

MATHEMATICS

Students entering on graduate study with a major in mathematics must hav had twenty hours of undergraduate work in mathematics besides the usual fresh man courses in algebra, trigonometry, and analytic geometry, including a one year course in calculus and one year of more advanced work in one or more o the fields of algebra, analysis, and geometry. They should be able to rea German or French.

Candidates for a doctor's degree taking a first minor in mathematics ar expected to have completed a course in calculus and are required to take tw

one-year courses beyond the calculus; candidates for a doctor's degree taking a second minor are required to complete at least one course throughout a year beyond the calculus.

The more technical courses offered by the department are arranged mainly in cycles of two or of three years, so that a properly qualified student will usually have opportunity to take any particular course at some time during the three years of residence required for the doctor's degree.

Courses for Graduates

100. Seminar.—For thesis work, or for special reading with the consent of the instructor. Three times a week; both semesters. *One to two units.* Professors Carmichael, Emch, Coble, Crathorne; Associate Professors Hazlett, Brahana, Trjitzinsky; Assistant Professor Levy. For the master's degree: Assistant Professor Bailey; Dr. Steimley, Dr. Bourgin, Dr. Pepper, Dr. Miles.

101. Functions of Real Variables.—Three times a week; both semesters. *One unit.* (Not given in 1936-37.)

104. Topology.—General principles with application to Riemann surfaces, uniformigation, and conformal mapping; related topics. Three times a week; both semesters. *One unit.* Dr. Doob.

110. Elliptic Functions.—Three times a week; both semesters. *One unit.* (Not given in 1936-37.) Professor Carmichael.

111. Differential Equations and Asymptotic Expansions.—Three times a week; both semesters. *One unit.* (Not given in 1936-37.)

112. Linear Difference Equations.—Three times a week; both semesters. *One unit.* (Not given in 1936-37.) Professor Carmichael.

113. Linear Differential Equations.—Three times a week; both semesters. *One unit.* Professor Carmichael.

114. Partial Differential Equations.—Three times a week; both semesters. *One unit.* (Not given in 1936-37.)

115. Advanced Topics in the Theory of Functions.—Modern aspects of the theory of functions of a real and of a complex variable; almost periodic and quasi-analytic functions; current investigations. Three times a week; both semesters. *One unit.* Associate Professor Trjitzinsky.

124. Theory of Numbers.—Theory of congruences, quadratic residues, quadratic forms; applications to modular invariants (formal and otherwise), algebraic numbers, and ideals. Three times a week; both semesters. *One unit.* Associate Professor Hazlett.

126. Theory of Groups.—Three times a week; both semesters. *One unit.* (Not given in 1936-37.)

129. Theory of Statistics.—Three times a week; both semesters. *One unit.* Professor Crathorne.

131. Algebraic Geometry.—Three times a week; both semesters. *One unit.* Professor Emch.

135. Differential Geometry.—Three times a week; second semester. *One unit.* Assistant Professor Levy.

143. Linear Algebras.—Three times a week; both semesters. *One unit.* (Not given in 1936-37.)

170. Algebra.—Three times a week; both semesters. *One unit.* Associate Professor Brahana.

171. Analysis.—Three times a week; both semesters. *One unit.* Dr. Martin.

172. Geometry.—Three times a week; both semesters. *One unit.* Professor Coble.

Courses for Graduates and Advanced Undergraduates

16-17. Differential Equations and Advanced Calculus.—Three times a week; both semesters. Assistant Professor Bailey, Dr. Steimley.

21. Theory of Probability.—Three times a week; second semester. Professor Crathorne.

22. Statistics.—May be counted only toward a minor in mathematics. Three times a week; first semester. Professor Crathorne.

30-31. Actuarial Theory.—Three times a week; both semesters. (Not given in 1936-37.) Professor Crathorne.

32. History of Mathematics.—Three times a week; second semester. (Not given in 1936-37.)

35. Teacher's Course.—May be counted only toward a minor in mathematics. Three times a week; first semester. Assistant Professor Bailey.

36. Advanced Aspects of Euclidean Geometry.—Three times a week; second semester. Dr. Moore.

40. Fundamental Concepts of Mathematics.—Three times a week; both semesters. Dr. Pepper.

52. Partial Differential Equations of Mathematical Physics.—Three times a week; both semesters. (Not given in 1936-37.)

53. Integral and Operational Equations in Mathematical Physics.—Three times a week; both semesters. Dr. Bourgin.

70. Introduction to Higher Algebra.—Three times a week; both semesters. Dr. Miles.

71. Introduction to Higher Analysis.—Three times a week; both semesters. Professor Coble.

72. Introduction to Higher Geometry.—Three times a week; both semesters. Assistant Professor Levy.

MECHANICAL ENGINEERING

The prerequisite for graduate work in mechanical engineering is the equivalent of the undergraduate course required for the degree of Bachelor of Science in mechanical engineering in the branches of the subject in which registration is desired. Courses offered to junior and senior students are open for minor credit to students majoring in other departments.

Courses for Graduates

107. Thermodynamics.—Application of thermodynamics to the solution of physical and engineering problems. Twice a week; both semesters. *One unit.* Professor Goff.

108. The Flow of Fluids and Heat Transfer.—The application of dimensional analysis and other rational formulas. Special problems. Twice a week; both semesters. *One unit.* Professor Macintire.

109. Mechanical Engineering Design.—(a) Machine design; (b) power plant design; (c) dynamics of machinery. Twice a week; both semesters. *One unit.* Professors Leutwiler, Ham.

110. Advanced Heating, Ventilating, and Air Conditioning.—Applications of various systems, notable developments, and results of research. Individual problems. Twice a week; both semesters. *One unit.* Professor Severns.

112. Laboratory Investigations.—Special problems in: (a) combustion; (b) steam; (c) gas and oil engineering; (d) heating, ventilation, and air conditioning; (e) refrigeration; (f) flow of fluids; (g) heat transfer; (h) mechanical transmission of power. Three times a week; both semesters. *One and one-half units.* Professors Polson, Kratz, Ham, Macintire, Goff.

117. Advanced Refrigerating Engineering.—Advanced theory and special cycles. Design of comfort cooling and other special installations. Twice a week; both semesters. *One unit.* Professor Macintire.

MINING ENGINEERING

The prerequisite for graduate work in mining engineering is the equivalent of the undergraduate courses required for the degree of Bachelor of Science in mining in the branches of the subject in which registration is desired.

Courses for Graduates

101. Advanced Mining Practice.—Twice a week; either semester. *One unit.* Professor Callen.

102. Advanced Preparation of Coal and Ores.—Twice a week; either semester. *One unit.* Assistant Professor Mitchell.

104.[1] Mining Reports.—Twice a week; either semester. *One unit.* Professor Callen.

105.[1] Welfare Work and Education among Mine Employees.—Twice a week; either semester. *One unit.* Professor Callen.

106.[1] Advanced Coal, Ore, and Metallurgical Plant Design.—Twice a week; second semester. *One unit.* Assistant Professor Mitchell.

107.[1] Advanced Non-Ferrous Metallurgical Projects.—Twice a week; either semester. *One unit.* Assistant Professor Mitchell.

Courses for Graduates and Advanced Undergraduates

6. Mechanical Engineering of Mines.—Three times a week; second semester. Professor Callen.

8. Mine Administration.—Three times a week; first semester. Mr. Nicholson.

9. Preparation of Coal and Ores.—Three times a week; first semester. Assistant Professor Mitchell.

15. Mine Ventilation.—Twice a week; second semester. Professor Callen.

20. Mine Ventilation Laboratory.—Twice a week; second semester. Professor Callen.

21. Mine Examination and Valuation.—Three times a week; second semester. Mr. Nicholson.

41. Principles of Mining and Metallurgical Design.—Three times a week; first semester. Assistant Professor Mitchell.

[1]Of courses 104 and 105 only one will be given either semester, according to election of students; the same applies to courses 106 and 107.

42. Mining and Metallurgical Design.—Twice a week; second semester. Assistant Professor Mitchell.

64. Mining Laboratory.—Twice a week; second semester. Assistant Professor Mitchell.

PHILOSOPHY

Students who enter on graduate work with philosophy as their major subject must have had a general course in the history of philosophy, a course in logic, and a general course in psychology.

Courses for Graduates

103. Ethics.—Twice a week; second semester. *One unit.* Professor Morrow.

105. Seventeenth Century Continental Thought.—Twice a week; first semester. *One unit.* Associate Professor Gotshalk.

106. English and American Idealism.—Twice a week; second semester. *One unit.* (Not given in 1936-37.) Professor Morrow.

108. Plato.—Twice a week; first semester. *One unit.* Professor Tawney.

110. Locke, Berkeley, Hume.—Twice a week; first semester. *One unit.* Professor Morrow.

112. German Idealism (Kant).—Twice a week; second semester. *One unit.* Associate Professor Gotshalk.

118. Medieval Philosophy.—Twice a week; second semester. *One unit.* Professor Tawney.

119. Seminar in Ancient Philosophy.—Twice a week; first semester. *One unit* Professor McClure.

120. Seminar in Modern Philosophy.—Twice a week; second semester. *One unit.* Professor McClure.

Courses for Advanced Undergraduates and Graduates

3. History of Ancient and Medieval Philosophy.—Three times a week first semester. Assistant Professor Nicholson.

4. History of Modern Philosophy.—Three times a week; second semester Associate Professor Gotshalk.

8. Philosophy of the Recent Past.—Three times a week; first semester Assistant Professor Nicholson.

9. Philosophy of Law and of the State.—Three times a week; second semester. Professor Morrow.

10. Philosophy of Science.—Three times a week; first semester (Not given in 1936-37.) Associate Professor Gotshalk.

11a. Philosophy of Religion (Systematic).—Three times a week; first semester. Professor Tawney.

11b. Philosophy of Religion (Historical).—Three times a week; second semester. Professor Tawney.

12. Philosophy of Art.—Three times a week; first semester. Associate Professor Gotshalk.

16. Metaphysics.—Three times a week; second semester. Associate Professor Gotshalk.

21. Theory of Knowledge.—Three times a week; first semester. Dr. DeLargy.

22. American Philosophy (Royce, James, Santayana, and Dewey).—Three times a week; second semester. Dr. DeLargy.

PHYSICS

A year of calculus and a year of general physics, with laboratory, are prerequisite for all major and minor graduate work in physics. In addition, graduate students majoring in physics must have had one more advanced course in either physics or mathematics and should be able to use references in German.

Courses for Graduates

122. Dynamics.—Three times a week; both semesters. *One unit.* Professor Kunz.

123. Dynamical Theory of Sound.—Three times a week; second semester. *One unit.* Professor Watson.

124. Conduction of Electricity through Gases.—Three times a week; second semester. *One unit.* Professor Knipp.

125. Hydrodynamics.—Especially modern problems in flow and turbulence. Twice a week; first semester. *One-half unit.* Professor Kunz.

126. Theory of Elasticity.—Three times a week; second semester. *One unit.* (Not given in 1936-37.) Professor Kunz.

127. Relativity.—Three times a week; first semester. *One unit.* (Not given in 1936-37.) Assistant Professor Mott-Smith.

128. Problems and Methods in Theoretical Physics.—Three times a week; first semester. *One unit.* (Not given in 1936-37.) Professor Kunz.

129. Mechanical Vibrations.—The general theory, with applications to plates, rotating shafts, gyroscopes, structures, etc. Twice a week; both semesters. *One-half unit.* (Not given in 1936-37.) Professor Kunz.

131a. Physical Laboratory Technique.—Especially glassblowing, vacuum technique, machine tools, and photography. First semester. *One unit.* Professor Knipp.

131b. Physical Laboratory Technique.—Especially spectroscopic light sources and electronic phenomena. Second semester. *One unit.* Associate Professor Kruger.

144. Electric and Magnetic Measurements.—Both semesters. *One unit.* (Not given in 1936-37.) Associate Professor Williams.

146. Electodynamics.—Four times a week; both semesters. *One unit.* Professor Kunz.

147. Electric Oscillations.—Twice a week; both semesters. *One-half unit.* (Not given in 1936-37.) Professor Kunz.

160. Thermodynamics.—Three times a week; first semester. *One unit.* (Not given in 1936-37.) Professor Kunz.

163. Statistical Mechanics.—Three times a week; second semester. *One unit.* (Not given in 1936-37.) Assistant Professor Mott-Smith.

170. Light.—Largely physical optics and spectroscopy. Lectures, assigned readings and recitations, with laboratory experiments. Both semesters. *One to two units.* Assistant Professor Almy.

183. Nuclear Structure.—Three times a week; first semester. *One unit.* (Not given in 1936-37.) Assistant Professor Bartlett.

184. Line Spectra and Atomic Structure.—Three times a week; first semester. *One unit.* Assistant Professor Kruger.

185. Band Spectra and Molecular Structure.—Three times a week; second semester. *One unit.* Professor Loomis.

186a–186b. Quantum Mechanics.—Three times a week; both semesters. *One unit.* Assistant Professor Mott-Smith.

190. Research.—Both semesters. *One to three units.* Professors in the department.

198. Seminar.—Both semesters. *One to two units.* Professors in the department.

199. Physics Colloquium.—Attendance is expected of all graduate students. Once a week; both semesters. *No credit.* Assistant Professor Mott-Smith.

Courses for Graduates and Advanced Undergraduates

14a-14b. Theoretical Mechanics.—Three times a week; both semesters. Assistant Professor Mott-Smith.

15. Electricity and Magnetism.—Recommended to students in non-technical courses. Two recitations or lectures and one three-hour laboratory exercise weekly; second semester. Associate Professor Williams.

16. Heat.—Introductory course. Three times a week; first semester. Associate Professor Paton.

17. Light.—Recommended to students in non-technical courses. Two lectures and a three-hour laboratory period weekly; first semester. Associate Professor Schulz.

23. Sound.—Three times a week; first semester. Professor Watson.

25. Architectural Acoustics.—Twice a week; second semester. Professor Watson.

30. Introduction to Theoretical Electricity.—For advanced students in physics, chemistry, mathematics, and engineering. Three times a week; first semester. Associate Professor Williams.

44a–44b. Electric and Magnetic Measurements.—Two three-hour periods a week; both semesters. Professor Knipp; Associate Professor Williams.

46. Advanced Electrical Measurements.—Two three-hour laboratory periods weekly; second semester. (Not given in 1936-37.) Associate Professor Williams.

51. Practical Optics.—Two lectures and a three-hour laboratory period weekly; second semester. Associate Professor Schulz.

60. Heat.—Three times a week; first semester. Associate Professor Paton.

61. Heat Laboratory.—To accompany Physics 60. One three-hour period a week; first semester. Associate Professor Paton.

62. Kinetic Theory of Heat and Radiation.—Three times a week; second semester. Associate Professor Paton.

71a–71b. Light.—For advanced students in physics, chemistry, mathematics or engineering. Twice a week; both semesters. Assistant Professor Al[illegible].

72a–72b. Light Laboratory.—To accompany Physics 71a-71b. Twice a week; both semesters. Assistant Professor Almy.

78. Radioactivity, Nuclear Physics, and X-rays.—Three times a week; second semester. (Not given in 1936-37.) Professor Loomis.

80. Atomic Physics.—A lecture and problem course presenting our modern knowledge of the nature and properties of atoms, ions, electrons, protons, positrons, light quanta, photoelectricity, thermoelectric emission, x-rays, radioactivity, and cosmic rays. Three times a week; first semester. Associate Professor Almy.

PHYSIOLOGY

The prerequisites for graduate work in physiology are Physiology 1, 1a, 5, 6, and 7, or equivalents.

Courses for Graduates

101. Journal Club.—Review of literature. Both semesters. *One-fourth unit.* Associate Professor Burge.

102. Research.—Both semesters. *One to two units.* Associate Professor Burge.

103. Special Phases of the Physiology of Respiration, Circulation, Digestion, Metabolism, Excretion, Secretion, Glands of Internal Secretion, Nervous System.—Both semesters. *One-half to one unit.* Associate Professor Burge, Assistant Professor Steggerda.

Course for Graduates and Advanced Undergraduates

6–7. Advanced Mammalian Physiology.—Five times a week; both semesters. Assistant Professor Steggerda.

POLITICAL SCIENCE

Graduate work in political science is conducted in the following special fields: (1) political theory; (2) international law and diplomacy; (3) modern government; (4) constitutional law, administrative law, and jurisprudence; (5) public administration.

To be admitted to take political science as a major subject, the student must have had at least 18 hours of undergraduate work in political science, economics, and history, not less than nine hours of which have been in political science. To take political science as a minor he must have had at least nine hours' work in these fields, including six hours in political science.

If a student making political science his major is taking both of his minors in other departments, one of them must be in history, economics, or sociology.

Several courses given in other departments are so closely related to those in political science that graduate students whose major is political science may be permitted on petition to take such courses as part of their major work. Attention is called to the courses in public law in the College of Law, the courses in public finance in the College of Commerce and Business Administration, the courses in city planning given by the College of Fine and Applied Arts, and the technical courses in municipal and sanitary engineering in the College of Engineering.

Courses for Graduates

1. History of Political Theories.—Three times a week; first semester. *One unit.* Professor Garner.

2. The Nature of the State.—Twice a week; second semester. *One unit.* Professor Fairlie.

3. Seminar in Political Science and Public Law.—Once a week; both semesters. Members of the department.

4. Municipal Administration.—Twice a week; second semester. *One unit.* Associate Professor Kneier.

5. Constitutional Law: Research in Selected Topics.—Twice a week; first semester. *One unit.* (Not given in 1936-37.) Professor Mathews.

106a–106b. Special Topics in International Law.—Research course. Twice a week; both semesters. *One unit.* Professor Garner.

107. Foreign Relations of the United States.—Twice a week; first semester. *One unit.* Professor Mathews.

108. Problems of International Organization.—Special problems in the field of international organization, with particular attention to the League of Nations. Twice a week; second semester. *One unit.* Professor Berdahl.

112. Studies in Public Administration.—Special topics in national, state, or local administration in the United States. Once a week; first semester. *One unit.* (Not given in 1936-37.) Professor Fairlie.

113. State Government: Research in Selected Topics.—First semester. *One unit.* (Not given in 1936-37.) Professor Mathews.

114. Studies in Political Parties.—Twice a week; first semester. *One unit.* Professor Berdahl.

121. Problems in British Administration.—Once a week; time to be arranged. *One unit.* (Not given in 1936-37.) Professor Fairlie.

128. Contemporary Governmental Problems.—Twice a week; first semester. *One unit.* Assistant Professor Hyneman.

Courses for Graduates and Advanced Undergraduates

4. Municipal Government.—Three times a week; first semester. Associate Professor Kneier.

5. The American Constitutional System.—Three times a week; second semester. Professor Mathews.

6a. International Law.—Three times a week; first semester. Professor Garner.

6b. International Law.—(Continuation of 6a.) Three times a week; second semester. Professor Garner.

7. American Foreign Relations.—Three times a week; first semester Professor Mathews.

8. International Organization.—Twice a week; second semester. Professor Berdahl.

9. Principles of Jurisprudence.—Three times a week; second semester Professor Fairlie.

11. The Constitution and Industrial Legislation.—Three times a week second semester. Assistant Professor Hyneman.

12. Public Administration.—Three times a week; second semester. Professor Fairlie.

13. Government Regulation of Business.—Three times a week; first semester Assistant Professor Hyneman.

14a. Political Parties: Party History and Issues.—Three times a week second semester. (Not given in 1936-37; alternates with Political Science 14b.) Professor Berdahl.

14b. Political Parties: Party Organization and Methods.—Three times a week; first semester. (Alternates with Political Science 14a.) Professor Berdahl.

18. Legislation in the United States.—Three times a week; second semester (Not given in 1936-37.)

21. British Government.—Twice a week; first semester. Professor Berdahl

22. Continental European Governments.—The constitutions and political systems of the principal countries of continental Europe. Three times a week; second semester. Professor Garner.

28. Current Governmental Problems.—Twice a week; second semester. (Not given in 1936-37.) Professor Mathews.

32. Principles of Political Science.—Twice a week; second semester. Professor Fairlie.

34. Municipal Problems.—Municipal administration in the United States and Europe. Three times a week; second semester. Associate Professor Kneier.

PSYCHOLOGY

Graduate students who elect psychology as their major subject must have had standard courses, of university grade, both in general psychology and in the psychological laboratory. One general university course is the minimal requirement for graduate students who apply to the department for a minor subject.

Training in clinical psychology is provided by courses offered at the Institute for Juvenile Research in Chicago. The prerequisite to these courses is recommendation by the Department of Psychology and one year of graduate work with a major in psychology, or, in case of especially qualified students who have majored in psychology as undergraduates, one semester of graduate work. The minimum period of attendance at the Institute necessary for the Master of Arts degree is six months; and for the Doctor of Philosophy degree, one academic year. Recommended minors are education and sociology.

Courses for Graduates

102. Translation of Psychological Treatises.—Critical reading of French and German books and articles. Both semesters. *One-half unit.* Professor Woodrow.

103. Research.—Experimental investigations. Both semesters. *One-half to two units.* Professors Woodrow, Young, Culler; Associate Professor Higginson.

105. Seminar.—Discussion of current topics in their historical setting, with especial emphasis upon research problems. Both semesters. *One unit.* Professor Woodrow.

106. Neural Theory of the Psychological Functions.—Second semester. *One unit.* Professor Culler.

108. Quantitative Methods.—The logic of research methods in psychology. Second semester. *One unit.* Professor Culler.

109. Problems of Motivation.—Discussion of current research and concepts within the field of motivation. Second semester. *One unit.* Professor Young.

The following courses (counted as courses in psychology when taken by candidates for advanced degrees in psychology) are offered at the Institute for Juvenile Research in Chicago by the Department of Criminology, Social Hygiene, and Medical Jurisprudence of the College of Medicine.

201. Research in Juvenile Behavior.—*One to three units.* Professor Schroeder.

102. Advanced Work in Juvenile Behavior.—*One to three units.* Professor Schroeder.

103. Special Abilities and Disabilities.—*One or two units.* Associate Professor Brown.

104. Psychological Tests.—*One or two units.* Associate Professor Brown.

105. Psychology of Behavior Problems.—*One or two units.* Associate Professor Brown.

Courses for Graduates and Advanced Undergraduates

5. Comparative Psychology.—A systematic survey of animal behavior with particular reference to the behavior of the vertebrates. Laboratory and discussion. Three times a week; first semester. Dr. McAllister.

8. Feeling and Emotion.—Facts, problems, and methods of affective psychology, with special reference to recent experimental studies. Twice a week; first semester. Professor Young.

9. Physiological Psychology.—The physiological basis of conscious experience. Twice a week; first semester. Professor Culler.

10. Mental and Physical Work (Industrial Psychology).—The psychology of work and the factors affecting it, with special reference to work in industry. Twice a week; second semester.

11. Learning and Comprehension.—Processes and functions in acquiring knowledge and skill. Twice a week; first semester. Professor Culler.

12–13. Minor Problems (Advanced Laboratory).—Application of methods suitable to new problems in general and comparative psychology. Three times a week; both semesters. Associate Professor Higginson.

14. Social Psychology.—Psychological factors in the control of group behavior and the adjustment of the individual to social situations. Three times a week; second semester. Dr. McAllister.

16. Genetic Psychology.—The psychological development of the individual with special reference to childhood. Twice a week; first semester.

17. History of Psychology.—Twice a week; first semester. Professor Young.

18. Perception.—Perceptual experience; recent revisions of perceptual theory including the doctrine of the *Gestalt.* Lectures and discussions. Twice a week; second semester. Professor Culler.

20. Systematic Psychology.—A critical study of contemporary systems: behaviorism, *Gestalt psychologie,* structural, functional and dynamic psychology. For seniors and graduates. Twice a week; second semester. Professor Woodrow.

21. Character and Personality.—An analysis of the non-intellectual aspects and determinants of mentality and conduct, with special applications to behavior problems and personnel psychology. Three times a week; first semester.

23. Abnormal Psychology.—Analytical consideration of types of behavior deviating from the normal. Three times a week; second semester.

26. Recent Experimental Problems.—Recent experimental methods and results. Twice a week; first semester. Dr. McAllister.

28. Motivation.—Drive, purpose, attitude, desire, sentiment, social incentive as determinants of behavior; conflict and adjustment. Twice a week; second semester. Professor Young.

34. Individual Differences.—A study of the variation in the mental characteristics of individuals and of groups. Three times a week; first semester. Professor Woodrow.

RAILWAY ENGINEERING

The prerequisite for graduate work in railway engineering is the equivalent of the undergraduate courses required for the degree of Bachelor of Science in engineering in the branch of the subject in which registration is desired.

Undergraduate courses 5 and 8 (Railway Laboratory) may be taken for major credit (½ unit each) toward the master's degree in railway engineering. Certain other undergraduate courses may be taken for minor credit.

Courses for Graduates

102. Locomotive Design.—Economic and legal considerations; specifications; weight distribution; relation of steam pressure, compounding, and superheat to performance and economy. Once a week; first and second semester. *Two units.* Or, once a week; either semester. *One unit.* Professor Young.

106. Locomotive Operation.—Train resistance and locomotive tractive force; locomotive tonnage ratings. Once a week; first and second semester. *Two units.* Or, once a week; either semester. *One unit.* Professor Schmidt.

110. Railway Location.—Effect of location on earning capacity; problems in original location, relocation, and reduction of grades of existing lines. Once a week; first and second semester. *Two units.* Or, once a week; either semester. *One unit.* Professor King.

ROMANCE LANGUAGES AND LITERATURE

A student entering on graduate work for an advanced degree must have had at least three years of college work in his major subject, including one advanced literary course.

Students who enter with a knowledge of Latin and of a second Romance language, together with a reading knowledge of German, will find their work for an advanced degree greatly facilitated.

FRENCH

Courses for Graduates

101. Old French Literature.—Twice a week; both semesters. *One unit.* Professor Oliver.

102. Villon, Rabelais, Montaigne, La Pléiade.—Twice a week; both semesters. *One unit.* Assistant Professor Will.

103. Seventeenth Century Literature.—Twice a week; both semesters. *One unit.* (Not given in 1936-37.) Professor Oliver.

104. Eighteenth Century Literature.—Twice a week; both semesters. *One unit.* Professor Oliver.

127. French Romanticism.—Twice a week; both semesters. *One unit.* Professor Carnahan.

128. Origin and Development of the Novel in France.—Twice a week; both semesters. *One unit.* (Not given in 1936-37.) Professor Carnahan.

129. Research Problems in French Romanticism.—Twice a week; both semesters. *One unit.* Professor Carnahan.

132. French Symbolism in Prose and Verse and the English and American Influences.—Twice a week; second semester. *One unit.* Professo Michaud.

133. Victor Hugo, His Influence and His Critics.—Twice a week; both se mesters. *One unit.* (Not given in 1936-37.) Professor Michaud.

144. Le Réalisme et le Naturalisme Français.—(In French.) Twice a week second semester. *One unit.* Professor Michaud.

145. Doctrines Littéraires et Courants d'Idées Contemporains.—(In French. Twice a week; both semesters. *One unit.* (Not given in 1936-37.) Pr fessor Michaud.

175. Old French Phonology and Morphology.—Twice a week; both semester *One unit.* (Not given in 1936-37.) Professor Oliver.

195. Seminar.—Research work in special topics. Both semesters. *One to tu units.* Members of the department.

Courses for Graduates and Advanced Undergraduates

10a–10b. General Survey of French Literature.—Three times a week; bo semesters. Professor Carnahan.

17a–17b. French Drama of the Nineteenth Century.—Twice a week; bo semesters. Associate Professor Hamilton; Assistant Professor Wr

24a–24b. French Drama of the Seventeenth and Eighteenth Centuries Three times a week; both semesters. Professor Oliver.

32a-32b. The French Novel of the Nineteenth Century.—Three times week; both semesters. Assistant Professor Jacob.

33a–33b. La Littérature Contemporaine.—(In French.) Twice a week; b semesters. (Not given in 1936-37.) Professor Michaud.

35a-35b. Civilisation Française. (Développement de la Culture Français —(In French.) Twice a week; both semesters. Assistant Profes Jacob (first semester); Professor Michaud (second semester).

ITALIAN

Courses for Graduates

140. Italian Literature in the Middle Ages. Petrarch, Boccaccio.—Twic week; both semesters. *One unit.* (Not given in 1936-37.) Profe Van Horne.

143. Italian Literature in the Renaissance.—Twice a week; both semest *One unit.* (Not given in 1936-37.) Professor Van Horne.

146. Modern Italian Literature.—Twice a week; both semesters. *One* Professor Van Horne.

195. Seminar.—Research work in special topics. Both semesters. *One to units.* Professor Van Horne.

Course for Graduates and Advanced Undergraduates

3a–3b. Dante: The Divine Comedy.—Twice a week; both semesters. Dismukes.

SPANISH

Courses for Graduates

130. Spanish Literature in the Sixteenth Century.—Twice a week; semesters. *One unit.* (Not given in 1936-37.) Professor Van Hor

131. Spanish Literature in the Seventeenth Century.—Twice a week; both semesters. *One unit.* Professor Van Horne.

134. Spanish Literature in the Eighteenth Century.—Twice a week; both semesters. *One unit.* (Not given in 1936-37.) Associate Professor Hamilton.

135. La Novela Española Moderna.—(In Spanish.) Twice a week; both semesters. *One unit.* Associate Professor Balseiro.

137. La Crítica Literaria en España.—Twice a week; both semesters. *One unit.* (Not given in 1936-37.) Associate Professor Balseiro.

138. Spanish-American Literature.—Twice a week; both semesters. *One unit.* Professor Van Horne.

139. Spanish Literature in the Middle Ages.—Twice a week; both semesters. *One unit.* Associate Professor Hamilton.

185. Old Spanish Readings.—Twice a week; both semesters. *One unit.* (Not given in 1936-37.) Associate Professor Hamilton.

195. Seminar.—Research work in special topics. Both semesters. *One to two units.* Members of the department.

Courses for Graduates and Advanced Undergraduates

10a–10b. General Survey of Spanish Literature.—Three times a week; both semesters. Associate Professor Hamilton.

11a-11b. Cervantes: Don Quixote.—Twice a week; both semesters. Professor Van Horne.

17a–17b. El Teatro Español Moderno.—Twice a week; both semesters. Associate Professor Balseiro.

SOCIOLOGY

Preparation for major work in sociology must include at least the equivalent of twenty-three semester hours in the social and biological sciences, of which at least eight must be in sociology. The remaining fifteen hours may be distributed among economics, philosophy, history, psychology, political science, and biology (heredity). Preparation for graduate work in sociology as a minor requires at least six hours of credit in sociology.

Courses for Graduates

00. General Sociology.—Twice a week; second semester. *One-half to one unit.* Professor Hiller.

02b. More Recent Developments in Sociology.—Twice a week; second semester. *One unit.*

06. Urban Communities and Urbanization.—Twice a week; first semester. *One unit.* Assistant Professor Tylor.

07. Rural Communities.—Twice a week; second semester. *One unit.* Assistant Professor Tylor.

08. Research in the Social Effects of Poverty, and Their Prevention and Treatment.—Twice a week; first semester. *One unit.* Assistant Professor Timmons.

09. Research in Criminology.—Twice a week; second semester. *One unit.* Professor Taft.

10. Population.—Twice a week; second semester. *One unit.* (Not given in 1936-37.) Professor Taft.

121. Folk Sociology.—Twice a week; second semester. *One unit.* (Not given in 1936-37.)

122. Regional Problems and Planning.—Twice a week; second semester. *One unit.* Professor Odum.

124. Advanced Penology.—Twice a week; first semester. *One unit.* Professor Taft.

128. Fusion of Culture Resulting from Immigration.—Twice a week; second semester. *One unit.* (Not given in 1936-37.) Professor Hiller.

129. Modern Human Migrations.—Twice a week; first semester. *One unit.* (Not given in 1936-37.) Professor Taft.

150. Seminar.—Preparation of theses. *One-half to three units.* Members of the department.

Courses for Graduates and Advanced Undergraduates

General Courses

3. Social Evolution.—Three times a week; first or second semester. Professor Ahrens.

4. Social Control.—Twice a week; first or second semester. Assistant Professor Albig.

5. The Family.—Three times a week; first or second semester. Assistant Professor Timmons.

6. Urban Sociology.—Three times a week; first semester. Assistant Professor Tylor.

7. Rural Sociology.—Three times a week; second semester. Assistant Professor Tylor.

Specialized Courses

8. Charities.—Three times a week; first or second semester. Assistant Professor Timmons.

9. Criminology.—Three times a week; first or second semester. Professor Taft.

10. Problems of Population.—Three times a week; second semester. (Given in 1936-37 and in alternate years.) Professor Hiller.

14. Group Opinion.—Three times a week; first or second semester. Assistant Professor Albig.

17. Methods of Sociological Research.—Three times a week; first semester. Professor Hiller.

20. Social Progress and Social Values.—Three times a week; second semester. (Not given in 1936-37.)

24. Penology.—Three times a week; second semester. Professor Taft.

27. Community Organization.—Three times a week; second semester. Assistant Professor Timmons.

28. Assimilation and Diffusion of Culture.—Three times a week; second semester. (Given in alternate years; not given in 1936-37.) Professor Hiller.

29. Modern Human Migrations.—Three times a week; first semester. Professor Taft.

30. Races of Mankind.—Three times a week; first semester. (Not given in 1936-37.)

40. Ethnology of the American Indians.—Three times a week; first semester. (Not given in 1936-37.)

42. Early Civilizations.—Three times a week; second semester. Assistant Professor Albig.

44. Negro Origins.—Three times a week; second semester. Professor Odum.

45. Prehistoric Archeology.—Three times a week; first semester. (Not given in 1936-37.)

THEORETICAL AND APPLIED MECHANICS

The prerequisite for the courses for graduates in theoretical and applied mechanics is the equivalent of the undergraduate courses in theoretical and applied mechanics required for the degree of Bachelor of Science in engineering. Courses offered to senior students are open for minor credit to students majoring in other departments.

Courses for Graduates

101. The Development of Basic Ideas in Mechanics.—Twice a week; first semester. *One unit.* Professor Moore.

103. Hydraulics.—Twice a week; either semester. *One unit.* Professor Enger.

107. Laboratory Investigations in Strength of Materials.—Twice a week; both semesters. *One-half to two units.* Professor Moore.

108. Laboratory Investigations in Hydraulics.—Twice a week; both semesters. *One to two units.* Professor Enger.

109. Laboratory Investigations in Plain and Reinforced Concrete.—Twice a week; both semesters. *One to two units.* Professor Richart.

110. Analytical Study of Experimental Work on Reinforced Concrete.—Beams, frames, and footings. Twice a week; first semester. *One unit.* Professor Richart.

111. Analytical Study of Experimental Work on Reinforced Concrete.—Columns and slabs. Twice a week; second semester. *One unit.* Professor Richart.

112. Structural Mechanics.—Three times a week; first semester. *One unit.* (Not given in 1936-37.)

113. Selected Topics in Structural Mechanics.—Twice a week; second semester. *One-half unit.* (Not given in 1936-37.)

114. Theory of Elasticity with Applications to Engineering Problems.—Three times a week; first semester. *One unit.* Dr. Newmark.

115. Theory of Elasticity with Applications to Engineering Problems (Continuation of 114).—Twice a week; second semester. *One unit.* Dr. Newmark.

116. Resistance of Materials.—Three times a week; first semester. *One-half to one unit.* Professor Seely.

117. The Properties of Engineering Materials.—Three times a week; second semester. *One-half to one unit.* Professor Seely.

123. Thesis.—Both semesters. *One unit.* Members of the department.

Courses for Graduates and Advanced Undergraduates

101. Advanced Mechanics of Materials.—Three times a week; first semester. Professor Seely, Mr. Dolan.

42. Engineering Materials.—Three times a week; second semester. Professor Seely, Mr. Dolan.

43. Laboratory Work in Hydraulics.—Twice a week; first and second semesters. Mr. Lansford.

44. Laboratory Work in Testing Materials.—Three times a week; first and second semesters. Professors Moore, Putnam.

ZOOLOGY

At least sixteen semester hours of college work in zoology are required for entering on major graduate study in this subject. Under special circumstances advanced work in closely allied subjects may be accepted in lieu of the fourth semester's work in zoology. When zoology is chosen for a minor the courses listed for graduates and undergraduates must be preceded by at least one full year's undergraduate work in zoology.

For the prosecution of graduate study in zoology a reading knowledge of German and French is indispensable and familiarity with Latin and Greek is of great advantage.

Graduate students specializing in zoology are strongly advised to spend at least one summer in study at the seashore. Every candidate for the doctor's degree will be required to furnish evidence of having completed satisfactorily at least one six-week period in such work at an approved location. To facilitate this plan an investigator's room has been provided at the Woods Hole Marine Biological Laboratory, where members of the department are offered research facilities without cost to themselves. Application for the use of this room should be made to the head of the department early in the year. Similar facilities are sometimes afforded at other marine laboratories.

Students interested in the field of genetics are referred especially to courses 115 and 124.

Courses for Graduates

102. Evolution of Vertebrates.—Twice a week; first semester. *One unit.* (Given in alternate years; not given in 1936-37.) Associate Professor Adams.

103. Cytology.—Twice a week; both semesters. *One unit.* (Given in 1936-37 and in alternate years.) Professor Shumway.

106. General Embryology.—Problems of development. Twice a week; both semesters. *One unit.* (Given in alternate years; not given in 1936-37.) Professor Shumway.

109. Physiological Ecology.—Twice a week; second semester. *One-half to one unit.* (Given in 1936-37 and in alternate years.) Professor Shelford.

110. Climatic Ecology.—Twice a week; second semester. *One-half to one unit.* (Given in alternate years; not given in 1936-37.) Professor Shelford.

111. Experimental and Field Ecology.—Both semesters. *One-half to two units.* Professor Shelford.

115. Factors of Individual and Racial Development.—Twice a week; both semesters. *One unit.* Professor Zeleny.

117. Invertebrate Taxonomy.—Twice a week; second semester. *One-half to one unit.* Professor Van Cleave.

118. Advanced Protozoology.—Twice a week; second semester. *One unit.* Associate Professor Kudo.

131. Helminthology.—Twice a week; first semester. *One-half to one unit.* Professor Van Cleave and Assistant Professor Thomas.

Individual Research Courses

121. Invertebrate Zoology and Parasitology.—*One to two units.* Professor Van Cleave and Assistant Professor Thomas.

122. Vertebrate Morphology.—*One to two units.* Associate Professor Adams.

124. Experimental Zoology and Genetics.—*One to two units.* Professor Zeleny.

125. Animal Ecology and Behavior.—*One to two units.* Professor Shelford.

126. Vertebrate Embryology and Cytology.—*One to two units.* Professor Shumway.

128. Protozoology.—*One to two units.* Associate Professor Kudo.

Courses for Graduates and Advanced Undergraduates

11. Animal Ecology and Geography.—Three or four times a week; first semester. Professor Shelford.

17. Field Zoology.—Two or three times a week; first semester. Professor Van Cleave.

18. Protozoology.—Twice a week; first semester. Associate Professor Kudo.

19a–19b. Vertebrate Ecology.—Twice a week; both semesters. Assistant Professor Kendeigh.

20a–20b. Current Investigations.—Must be taken by all graduate students whose major is in zoology. Once a week; both semesters. Members of the department.

21a–21b. Introduction to Zoological Research.—Two to five times a week; both semesters. Members of the department.

22–23. Comparative Anatomy of Vertebrates.—Two to four times a week; both semesters. Associate Professor Adams.

25. Experimental Genetics.—Two or three times a week; second semester. Dr. Luce.

31. Helminthology.—Twice a week; second semester. Assistant Professor Thomas.

33. Comparative Vertebrate Embryology.—Two to five times a week; first semester. Professor Shumway.

36. Vertebrate Organogeny.—Two to five times a week; second semester. Professor Shumway.

44. Advanced Invertebrate Zoology.—Two or three times a week; second semester. (Not given in 1936-37.) Professor Van Cleave.

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UNIVERSITY OF ILLINOIS

The Graduate School

Announcement for 1937-1938

PUBLISHED BY THE UNIVERSITY OF ILLINOIS
URBANA

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PA

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Mining and Metallurgical Engineering
Philosophy
Physical Education
Physics
Physiology
Political Science
Psychology
Railway Engineering
Romance Languages and Literature
French
Italian
Spanish
Sociology
Theoretical and Applied Mechanics
Zoology

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UNIVERSITY OF ILLINOIS
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GRADUATE SCHOOL CALENDAR

Summer Session

1937

June 21, Monday.....Registration day.
June 22, Tuesday.....Instruction begun.
July 23, Friday.....Latest date for registering for French ar
German examinations.
July 30, Friday.....Examination in French.
Aug. 6, Friday.....Examination in German.
Aug. 7, Saturday, 12 M.....Latest date for candidates for degrees
August to deposit theses.
Aug. 13, 14, Friday, Saturday.....Summer Session examinations.

First Semester

Sept. 17, 18, Friday, Saturday.....Registration days.
Sept. 18, Saturday.....Latest date for registration of former studer
without penalty.
Sept. 18, Saturday.....Latest date for registering for French a
German examinations.
Sept. 20, Monday.....Latest date for candidates for masters' degre
in October to file applications for degre
and to deposit theses.
Sept. 22, Wednesday, 8 A.M.....Instruction begun.
Oct. 1, Friday.....Examination in French.
Oct. 8, Friday.....Examination in German.
Oct. 9, Saturday, 12 M.....Latest date for changing study-lists witho
fee.
Oct. 15, Friday.....Latest date for preliminary examinations (r
full residence).
Nov. 1, Monday.....Latest date for candidates for professio
engineering degrees to file statements
professional study and experience.
Nov. 24, Wednesday, 12 M.....Thanksgiving recess begun.
Nov. 29, Monday, 1 P.M.....Instruction resumed.
Dec. 23, Thursday, 12 M.....Holiday recess begun.
Dec. 31, Friday, 5 P.M.....Latest date for candidates for professio
engineering degrees to submit outlines
theses.

1938

Jan. 3, Monday, 1 P.M.....Instruction resumed.
Jan. 15, Saturday, 12 M.....Latest date for registering for French a
German examinations.
Jan. 17, Monday.....Latest date for filing applications for mast
degrees to be conferred in February.
Jan. 17, Monday.....Latest date for candidates for Ph.D. degre
February to deposit theses.
Jan. 25, Tuesday.....Semester examinations begun.
Jan. 28, Friday.....Examination in French.
Jan. 31, Monday.....Latest date for candidates for masters' deg
in February to deposit theses.
Feb. 2, Wednesday.....Semester examinations ended.
Feb. 4, Friday.....Examination in German.

Second Semester

1938

Feb. 4, 5, Friday, Saturday.....Registration days.
Feb. 5, Saturday.....Latest date for registration of former students without penalty.
Feb. 9, Wednesday, 8 A.M.....Instruction begun.
Feb. 26, Saturday, 12 M.....Latest date for changing study-lists without fee.
Feb. 28, Monday.....Latest date for preliminary examinations (for full residence).
March 1, Tuesday.....Latest regular date for applications for scholarships and fellowships for 1938-39.
April 1, Friday.....Latest date for filing applications for masters' degrees to be conferred in June.
April 14, Thursday, 12 M.....Easter recess begun.
April 16, Saturday.....Latest date for registering for French and German examinations.
April 19, Tuesday, 1 P.M.....Instruction resumed.
April 29, Friday.....Examination in French.
May 2, Monday.....Latest date for candidates for professional engineering degrees to deposit theses.
May 6, Friday.....Examination in German.
May 14, Saturday.....Latest date for filing applications for masters' degrees to be conferred in August.
May 14, Saturday.....Pre-registration for masters' degrees to be conferred in August.
May 16, Monday.....Latest date for candidates for Ph.D. degree in June to deposit theses.
May 27, Friday.....Semester examinations begun.
May 31, Tuesday.....Latest date for candidates for masters' degrees in June to deposit theses.
May 31, Tuesday.....Latest date for Ph.D. finals.
June 6, Monday.....Semester examinations ended.
June 13, Monday.....Sixty-seventh Annual Commencement.

Notes

Examination in one foreign language must be passed before residence on second year may be counted (pp. 13, 16).

Two copies of thesis are required of candidates for masters' and doctors' degrees (pp. 13, 17).

Candidates for masters' degrees announce thesis subjects at beginning of second half-year of work, or after completion of four units, or at beginning of third summer session (p. 13).

Candidates for Ph.D. degree announce thesis subjects within six weeks from beginning of third year of residence (p. 17).

Candidates for Ph.D. degree deposit theses two weeks before date of final examination (p. 17).

THE GRADUATE SCHOOL
EXECUTIVE FACULTY

ARTHUR CUTTS WILLARD, B.S., D.Eng., LL.D., *President of the University*

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THE GRADUATE SCHOOL

History and Organization

The University of Illinois offered facilities for advanced study and research n various lines as early as 1872. Organized graduate instruction, however, nder the name of the Graduate School, was first undertaken in 1892. In 1894 he administration of the school was vested in the Council of Administration, nd the Vice-President of the University became Dean of the School. In 1906 he Graduate School was organized as a separate faculty.

By action of the Trustees the teaching faculty of the Graduate School in-ludes all members of the University Faculty who give instruction in approved raduate courses. The affairs of the School, however, are in charge of the Executive Faculty.

Admission

Admission to the Graduate School may be granted to graduates of institu-ions whose requirements for the bachelor's degree are substantially equivalent o those of the University of Illinois and to applicants from other institutions pproved by the Executive Faculty, as hereinafter provided. *Admission to the Graduate School does not, however, imply admission to candidacy for an ad-anced degree, and gives no right or claim to be so admitted. A mere accumu-ation of "credits" or "grades" is not sufficient.*

Admission to graduate courses may be granted only to those who have had he requisite undergraduate work in those courses or departments. But a student f mature age who satisfies the Dean and the department concerned of his bility to pursue graduate work in a given line may be enrolled in particular raduate courses, without reference to a degree, and permitted to carry on such tudy or investigation under the direction of a department of the University s the department shall recommend and the Dean approve.

Application blanks for admission may be secured from the Registrar of the Jniversity. Every applicant must submit with his application for admission an fficial transcript of his college record. All students, except those entering only or summer sessions, who have not previously taken a physical examination at he University, must take such an examination. The examination is given by the Jniversity Health Service without cost to the student, if taken at the time of ppointment during the registration period.

Character of Graduate Work

The principal aim of graduate study is the development of the power of ndependent work and the promotion of the spirit of research. Each candidate or a degree is expected to have a wide knowledge of his subject and of related elds of work; for the graduate student is not expected to get from lecture nd laboratory courses all the knowledge and training necessary to meet the equirements for his degree.

Registration and Program of Study

The following regulations concerning registration and program of studies re laid out primarily for first-year students. Second-year and third-year gradu-

ate students fill out their programs irrespective of the unit value of courses, a cording to their needs, under the advice of their instructors.

Registration.—Each graduate student must register at the beginning each semester. The registration of a new student may be accepted at any tir provided the student is prepared to take up courses actually under way. Cre towards the fulfillment of the residence requirement dates, however, from t time of registration and not from the beginning of the semester or year in whi the student enters.

A new student must fill out in duplicate an application for admission a submit it to the Registrar, from whom, after the approval of his applicatic he will receive a card of admission and a study-list which will give details procedure in registering. He should fill out the study-list after consultation wi his adviser, or the person in charge of his major work, and also with the i structors whose courses he wishes to elect. *Registration, including the payme of fees, must be completed by the close of the registration days of the Gradu School. Otherwise a fee of $5.00 for late registration will be charged all forn students of the University of Illinois.*

Changes in Study-lists.—A graduate student is expected to plan his wo so carefully that changes in his study-list during the semester will not be nec sary. When a change seems advisable, however, it may be permitted with fee if made within three weeks of the date of registration. After that date fee of one dollar is charged for each change, except that the total charge f rearrangement authorized on any one change slip shall not exceed two dolla.

Advanced Undergraduate Courses Open to Graduate Students.—

1. *Courses not open to students below senior standing.* Unless otherw specified on the student's program by the department concerned, such cour listed for four or five hours of undergraduate credit are treated as unit cour for graduate credit, or as half-unit courses when listed for less than four ho of undergraduate credit.

2. *Courses open to students of junior standing.* Unless otherwise specifi on the student's program by the department concerned, such courses listed f four or five hours of undergraduate credit are treated as half-unit courses f graduate credit, or as quarter-unit courses when listed for two to three ho undergraduate credit. Courses to which sophomores are regularly admitted m not be taken for graduate credit, either major or minor.

Seniors and Graduate Study.—If at the beginning of the second semes of his senior year a student who has been in residence at least one year is wit five hours of a bachelor's degree, he may be permitted to register for cour which may count for residence for a master's degree, provided his progr is limited to approximately twelve formal class, lecture, or laboratory exerci a week, and is approved by the Dean at the time of registration. Only stude of excellent record will be allowed this privilege.

Miscellaneous and Listeners' Courses.—Graduate students are permit under proper circumstances to attend classes as listeners, and to elect misc laneous subjects, that is, courses which do not count toward an advanced deg A graduate student in full standing and carrying a minimum program, may e permitted, under proper circumstances, to elect one miscellaneous subject (t is, a course which does not count towards an advanced degree). No subj

open as a miscellaneous course unless it has a specific educational bearing n the student's major or minor subjects of study.

A student who elects a miscellaneous course is required to register in it, do ie work, and pass the semester examinations, unless he is permitted to with-raw under the rules. A student who attends as a listener is not permitted to articipate in the class work or the examination.

No student may register for a full minimum program of work for graduate redit if it is necessary for him to carry at the same time more than one mis-ellaneous subject.

Students on the Staff.—Assistants and others on the university staff who ndertake to do graduate work are permitted to take an amount of work de-rmined by the terms of their employment. Such a student, if required by his ngagements to teach more than five classes a week or to have laboratory work r supervision exceeding ten hours a week, will find it impossible to complete ie work for the master's degree in one year, or the doctor's degree in three ears.

Residence and Work Done Elsewhere.—Continuous residence and study re required of all members of the Graduate School, unless they are granted ave of absence by the Dean, upon recommendation of the professor in charge f their work, for the purpose of carrying on elsewhere studies or investigation n the line of work for their degrees.

Graduate Study in the Summer.—Graduate students in the summer ses-on are subject to the same scholastic requirements as those in the regular uni-ersity year. Their study-lists must be approved by the Dean of the Graduate chool, or his representative. Two to two and one-half units of graduate work ay be taken in the summer session. Two units is considered a full minimum rogram for the summer. Attendance during four out of six consecutive ummer sessions, or one semester and two summer sessions, is considered the quivalent of one year in residence. No course offered in the summer session ay be taken for credit towards a higher degree unless it is described in the ummer-session circular as accepted for that purpose.

The Executive Faculty may, at the request of a given department, accord ecognition to its summer session work subject to the following conditions: 1) Study in the University of Illinois summer session may be counted in par-al fulfillment of the residence requirements for the degree of Doctor of hilosophy, but at least one continuous academic year of residence at the Uni-ersity at some time during the second or third years of the doctoral program required. (2) Persons electing to use this plan shall be required to submit a hedule of study covering the second and third years of work toward the octorate. This schedule of study must be approved by the adviser in charge the major subject and by the Dean of the Graduate School. (3) Apart from e provisions stated above, the present practices and standards of the Graduate chool relating to the doctorate shall be continued.

Graduate Work in Medical and Dental Sciences.—Graduate courses in edical and dental sciences are offered in the Colleges of Medicine and entistry of the University of Illinois, and summer courses are offered in the ollege of Medicine. Circulars describing the courses offered and conditions of mission and work may be obtained from the Committee on Graduate Work the College of Medicine, 1853 West Polk Street, Chicago.

FAILURES.—A graduate student who fails in any course in his major subje cannot secure his degree in the same year in which the failure occurred. N condition examinations are given graduate students.

WITHDRAWAL.—If after registration a graduate student wishes to withdra from any course or to add other work, he must first secure the necessary pape from the Dean's office. See the regulations concerning changes in study-list page 10. If he wishes to withdraw from the University he must get clearan papers at the Dean's office.

Masters' Degrees

CHARACTER OF MASTERS' DEGREES.—The master's degree conferred depen upon the character of the bachelor's degree. The usual practice is that A.I shall follow A.B., and that M.S. shall follow B.S. However, this practice m be departed from in cases where the undergraduate course of study of the ca didate was of a kind for which some reputable institutions in this country gi A.B., while others give B.S.

AMOUNT OF WORK REQUIRED.—Candidates for the degree of Master of A or Master of Science are required to do at least one full year's work in re dence, usually including a thesis. Four to five units constitute a normal sem ter program for the master's degree. A minimum of eight units must be co pleted for the degree. Only first-rate students are permitted to secure a deg with this minimum program. In some departments special examinations a required of candidates for masters' degrees. In all cases the student must sati the duly approved conditions set by his major and minor departments.

Unless otherwise permitted, every student must take each semester at le one course open to graduate students only (courses numbered 100 and upward

In the first year of his graduate study each student is required to attend minimum of four formal class, lecture, or laboratory exercises a week. Sch ules involving an unusually large number of formal class meetings per w will require the special approval of the Dean.

WORK DONE ELSEWHERE.—Members of the staff and high school teach residing and employed in Urbana or Champaign who have done graduate wo in approved institutions elsewhere may secure credit not to exceed four un towards the master's degree by passing examinations in that work. They m complete the work for the degree by securing at least four units more wh registered in the Graduate School for not less than one academic year.

Graduate students who have been in residence one semester or its equival t may offer for credit not more than nine weeks of work at a marine or fre - water biological laboratory or in biological or geological field work, on condit n that the work be of graduate grade under a qualified instructor or director s certified by the student's major adviser and approved by the Dean of the Gra - ate School; that approval be obtained by the student in advance; and tha a written report of the work accomplished be presented by the student and - proved as satisfactory by the student's major adviser.

MAJORS AND MINORS.—A candidate for a master's degree may do all s work in one subject, or he may select a major and one minor, or a major a two minors. A major or minor denotes the field of knowledge of a departme or such part thereof as constitutes a separate and independent division of t

eld. For a master's degree a major is at least half the work, or a minimum of our units, for one year. Less than one unit may not be counted as satisfying ie requirements of a minor without the approval of the department concerned.

Foreign Language.—The ability to use one or more of the modern languages rdinarily studied in the undergraduate curriculum is desirable for all candidates or the master's degree, and in some lines of study is required. No student will e permitted to acquire residence toward the second year for the doctorate until e has passed the preliminary examination in at least one of these languages.

Masters' Theses.—Each candidate for a master's degree is required to resent two copies of a thesis on some subject approved by the professor in harge of his major work. Such approval, except in case of students working or masters' degrees in summer sessions only, must be secured and the subject f the thesis filed at the office of the Graduate School not later than the beinning of the second half-year of residence. Students working for masters' egrees exclusively in summer sessions must announce their thesis subjects not ater than the beginning of their third session in residence. The requirement of thesis may be waived, however, on the recommendation of the professor in harge of his major work and the approval of the Dean, *provided application to aive the thesis is made at the time for announcing thesis subjects.* A student xcused from writing a thesis must replace it with courses of instruction.

No one will be excused from writing a thesis unless one-half of his proram of studies consists of courses numbered 100 and upwards.

The thesis required from a candidate for a master's degree will ordinarily emand from one to two units of work, and may not exceed three units except y special permission. The thesis must be typewritten, on "thesis paper,"[1] and ie title page must be printed. The carbon copy may be on plain paper of approximately the same weight as the thesis paper. Both copies of the thesis in its nal form, together with a certificate of approval by the proper officer, must be ft at the Dean's office at least two weeks before the date on which the degree to be conferred. No article prepared for another use, or previously published, ill be accepted as a thesis.

Applications for Degrees.—Each candidate for the degree of Master of rts or Master of Science shall file an application for the degree on a blank ovided for the purpose, to be had at the Dean's office. For the dates of apications and of deposition of theses, consult the calendar at the beginning of e bulletin.

Degrees in August.—Students who expect to become candidates for the aster's degree in August may be recommended at the June meeting of the enate subject to the successful completion of the work for which they are register in the summer session. However, in order to avail themselves of this ivilege, students must file with the Dean before the June meeting of the Sene an exact statement of the work necessary to complete the requirements for e degree. Blanks for this purpose may be secured at the Dean's office. For e dates of filing application and pre-registration blanks, consult the calendar the beginning of the bulletin.

Thesis Work on Leave of Absence.—Under proper conditions a student ay be permitted to complete the last fourth of his work, if devoted to his

[1]No other will be accepted by the Dean. "Instructions for the Preparation of Theses" ay be obtained at the Dean's office.

thesis, under leave of absence for a period not to exceed the equivalent of two semesters. To get such permission the student must have secured credit for at least six units; must petition for the privilege; must submit to the Dean an outline of the proposed investigation, approved by the professor in charge of his major work, and must submit satisfactory evidence that adequate facilities are available to him at the place where he intends to do the proposed work. Approval on all these points must be obtained one collegiate year before the thesis is due. Immediately following approval the student must register and pay an incidental fee of $20.00.

GRADES.—Students' work is graded in five classes, A, B, C, D, and E. The last indicates a failure. D indicates unsatisfactory, though passable, work.

A student who receives two units of a grade below B during his first year of graduate work may not complete the first year of residence by carrying the minimum program of eight units for the master's degree. Three units of a grade below B disqualify a student as a candidate for a degree.

A failure or absence from examination in any course or failure in any other examination prescribed by the department of the major may prevent the conferring of the degree; and, as already indicated, failure in any course in the major field precludes the conferring of the degree in the same year.

Second Degrees in Engineering

Two classes of second degrees are open to graduates of the College of Engineering, namely, academic and professional.

The *academic* second degree in engineering is Master of Science, following Bachelor of Science, in civil engineering, electrical engineering, etc. This degree is conferred in accordance with the regulations described above for *academic work in residence only.*

The *professional* second degrees in engineering are as follows:

Master of Architecture, after B.S. in architecture.

Architectural Engineer, after B.S. in architectural engineering.

Ceramic Engineer, after B.S. in ceramic engineering.

Chemical Engineer, after B.S. in Chemical Engineering.

Civil Engineer, after B.S. in civil engineering or in railway civil engineering.

Electrical Engineer, after B.S. in electrical engineering or in railway electrical engineering.

Mechanical Engineer, after B.S. in mechanical engineering or in railway mechanical engineering.

Engineer of Mines, after B.S. in mining engineering.

Engineer-Physicist, after B.S. in engineering physics.

Professional degrees in engineering may be conferred on two classes of candidates: (1) those who have received an academic degree in engineering from the University of Illinois; (2) those who have received an academic degree in engineering[1] from other institutions of equal standing and who have been members of the teaching or research staff of the College of Engineering or Engineering Experiment Station or the Department of Chemistry of the University of Illinois for at least three years prior to the conferring of the professional degree.

[1]Including chemical engineering.

A candidate declares his candidacy by filing with the Dean of the College of Engineering, as chairman of the committee in charge, a detailed statement covering his professional engineering experience. This statement must be made upon a standard form supplied by the Dean of the College of Engineering, as chairman of the committee in charge, and must be filed not later than the first Monday in November preceding the commencement at which the candidate expects to receive the degree. No statement of experience will be considered by the committee which does not show that the candidate has had a minimum of four years of acceptable engineering experience after receiving the degree of Bachelor of Science, and that for at least three years he has been in responsible charge of engineering work. Responsible charge in engineering teaching may be considered as responsible charge of work. In determining the acceptability of the engineering experience of the candidate the committee will be guided by the character of his professional work and the degree of responsibility involved, and will take into consideration such evidences of professional ability and growth as may be shown by his investigation of engineering problems, his contributions to technical literature, and his membership and activity in engineering societies.

If the professional experience of the candidate is accepted he must submit for approval, prior to December 31, an outline of his proposed thesis. The completed thesis, in the form prescribed in the "Instructions for the Preparation of Masters' and Doctors' Theses," must be deposited with the Dean of the College of Engineering not later than May 1. The candidate must present himself at commencement in order to receive the degree.

A candidate for a professional engineering degree must pay the incidental fee of twenty-five dollars on being notified that his professional experience is accepted as qualifying him to enter as a candidate for the degree. No one will be enrolled as a candidate for the degree at the following commencement who does not pay his fee at this time. When a candidate for a professional engineering degree has once been accepted and paid his fee, he is eligible to receive the degree at any time within five years, without additional fee, on completion of the requirements; provided, however, that unless he completes the requirements within two years his name will be dropped from the list of candidates and in order to receive the degree within the five-year period he must register once more.

The Degree of Doctor of Philosophy

Major and Minor Subjects.—A member of the Graduate School who desires to become a candidate for the degree of Doctor of Philosophy is required to pursue a major subject in the department in which his research lies. He is also required to choose one minor subject, or he may choose two. If one minor only is chosen it must be taken in a department of study other than that of the major, and credit for it may be earned by work representing not less than four units, or one-sixth of the total residence required for the doctorate. If two minors are chosen, one must be a subject closely related to the major. With the approval of the adviser and the Dean it may be a division of the major field of study. The other minor (not less than two units) must, in that case, be taken in a department of study other than that of the major.

Except by special permission of the Dean the preliminary examination in major and minor subjects may not be taken until the minor work has been done

Method of Computing Residence.—Credit for a full year of graduate work means that the student has during that time devoted all his working time and energy to study of a graduate grade. After the first year of residence, credit is not recorded in units, and there is no fixed correspondence between credit and courses as in undergraduate work.

Period of Study.—The normal *minimum* period of study required for securing the degree of Doctor of Philosophy is three years, during which the student is required to devote all his working time to his studies. All three years must be spent in resident graduate study at some accredited educational institution and either the first two or the last one of the three must be spent at the University of Illinois. The degree is conferred, however, not for residence during a certain period, but for scholarly attainments and power of investigation, as proved by a thesis and examinations. For study in summer sessions, see page 11.

Work Done in Other Universities.—Credit for graduate work done in other universities is not "transferred." However, it may be accepted on examination as equivalent to resident work at the University of Illinois, provided the institution in which it was done is of high standing.

Preliminary Examinations.—

A. In Languages.—The student will be required to demonstrate his ability to read French and German and other languages needed in his work. (In special cases the Executive Faculty, upon recommendation of the student's adviser, may substitute for either one of the languages usually required some other language which can be shown to be more useful in that student's professional research.) No student will be permitted to acquire residence towards the second year of graduate study until he has passed the examination in at least one of these languages. Both the examination in French and that in German must be passed before the student is admitted to the preliminary examination in his major and minor subjects. For the dates of these language examinations consult the calendar at the beginning of this bulletin. See calendar for date when application for admission to these examinations must be made.

B. In Major and Minors.—Towards the end of his second year of study, or by special permission, at the beginning of his third year (not later than about October 15), a student who wishes to become a candidate for the degree must submit to a preliminary examination conducted by a committee appointed by the Dean. This examination is intended to test the student's knowledge of the field of his major and minor subjects of study and to determine whether he is prepared for the final year of work for the doctorate. It is partly oral, and may be wholly so.

The student will not be admitted to his preliminary examination until the faculty is satisfied that he has finished substantially the equivalent of two years graduate work. He must do a full year's graduate work between his preliminary examination and the completion of his work for the doctorate.

Final Examination.—At least two weeks before the time when the degree is conferred, the candidate must submit to a final examination, given by a committee appointed by the Dean. This examination is primarily on the research work of the student, as embodied in his thesis, but it is not confined to that. I

xtends to the whole field of study of the candidate. It will not be confined to he courses which the candidate has attended in the University of Illinois only, f he has done part of the work elsewhere; nor even to the field covered by the ourses specifically taken in this or other universities; but will be so conducted s to determine whether the candidate has a satisfactory grasp of his major ubject as a whole, and a general acquaintance with the fields of knowledge epresented by his course of study.

The final examination may not be divided. The examination must be taken ll at one time even though it requires several sessions.

If after having passed his preliminary examination, he fails in the third year f his study to meet the expectations of the professors in charge of his work, r in any way fails to maintain the standard of scholarship and power of re-earch expected of him, he may be refused admission to the final examination.

Other Examinations.—Before the candidate is admitted to the final ex-mination and the defense of his thesis, he may be required to take any other xamination, oral or written, that is thought proper by the various departments n which he has studied.

The above examinations are in addition to those in the courses for which he student is registered. These must be taken at the time for which they are et in the examination schedule.

Thesis.—The power of independent research must be shown by the produc-ion of a thesis on some topic connected with the major subject of study. The andidate is expected to defend his thesis or dissertation before the members f the faculty, or as many of them as may wish to question him about it, in con-ection with his final examination.

The subject of the thesis should be chosen not later than the end of the econd year of residence and must be submitted for formal approval by the aculty not later than six weeks from the beginning of his third year of resi-lence.

Two typewritten copies of the complete thesis, *the original on thesis paper,*[1] nd the first carbon on plain paper of approximately the same weight, and in inal form, must be deposited in the office of the Dean for presentation to the xamining committee not later than two weeks prior to the final examination nd not less than four weeks before the time when the degree is conferred. At he same time, the candidate must deposit with the Dean a manuscript of the ssential part, or an abstract, or a digest of his thesis, in condition for pub-ication at a cost not to exceed seventy-five dollars ($75). The manuscript must e sufficient to show the method followed, the evidence used, and the conclusions eached in the investigation, and must bear the approval of the department nd the Executive Faculty of the Graduate School.

The candidate must pay to the Comptroller before graduation the sum of eventy-five dollars ($75) out of which the University will print at least one undred copies of this manuscript for circulation by the University, unless the hesis entire or in abbreviated form is published by the author or is accepted or publication by a standard journal or publisher within a year from the date f graduation. In the latter event, and after one hundred copies have been pre-ented to the University by the writer, the cash deposit shall be returned to him.

[1]No other will be accepted by the Dean.

The typewritten and printed forms of the thesis must comply with the regulations given in "Instructions for the Preparation of Masters' and Doctors' Theses," copies of which may be obtained at the Dean's office.

Degree of Doctor of Philosophy in Engineering

The degree of Doctor of Philosophy in Engineering is offered in certain lines of academic work of a high scholastic type in engineering science for students who wish to prepare themselves as teachers, investigators, and experts.

The general requirements for this degree, as to preliminary education, linguistic attainments, etc., are the same as in other subjects.

The following lines of engineering science, or others approved by the Graduate School, may be elected as majors:

Engineering mechanics
Steam engineering
Hydraulic and sanitary engineering
Electrical engineering
Heating and ventilation engineering
Railway engineering
Masonry construction and structural engineering
Coal-mining engineering
Ceramic engineering
Chemical engineering

The first minor may be any of the above or one of the following sciences or an authorized combination of two of them:

Theoretical mechanics
Mathematics
Thermodynamics
Bacteriology
Chemistry
Geology
Physics (experimental or mathematical)
Zoology
Botany
Economics

The second minor should be in other than engineering subjects.

Agricultural and Engineering Experiment Stations

Attention is called to the unusual opportunities for graduate study in connection with the Agricultural and Engineering Experiment Stations. By undertaking a line of graduate study in close association with some one of the projects carried on in those Stations, the student will come into contact with aspects of his specialty which he would rarely touch in a purely academic study, and he will thus broaden his outlook. The Experiment Stations make available apparatus, equipment, and the services of mechanicians, which may materially facilitate the carrying on of investigations.

Scholarships and Fellowships

A number of scholarships and fellowships have been established by the Trustees of the University open to candidates who are not over thirty years

of age at the time when the appointment is to be made. To first-year graduate students of ability and promise there are open a number of scholarships with stipends of $300 and carrying exemption from the payment of tuition, incidental, and laboratory fees. There are two classes of fellowships—University Fellowships and Honorary Fellowships. The first are open to second-year and third-year graduate students with stipends of $500 and $600, respectively. To be eligible for a $600 fellowship an applicant must have passed both language examinations before the date for filing applications and must be prepared to take the preliminary examination in his major and minor subjects by the following June. Honorary Fellowships carry no stipends and no exemption from the payment of fees. Their purpose is to give recognition to superior students who are not in need of financial assistance.

Candidates for these scholarships and fellowships must be graduates of the University of Illinois, or of colleges or universities having equivalent requirements for bachelors' degrees.

Application must be made on blanks to be obtained from the Dean of the Graduate School. These application forms should be sent to the Dean of the Graduate School as early as possible in February of the academic year preceding that for which the fellowship is desired. No application will be considered if received later than March first, until after April fifteenth, the date when appointees from the first list of applications must accept or refuse their appointments.

Persons appointed are notified on April first and must send the Secretary of the Board of Trustees notice of their acceptance or refusal by April fifteenth; and must agree that, if accepted, the appointment will not be resigned to take a similar one in any other institution during the year for which it is awarded.

Nominations to fellowships are made on the grounds of worthiness of character, scholastic attainments, and promise of success in the principal line of study or research to which the candidate proposes to devote himself.

Research Graduate Assistantships in the Engineering Experiment Station

The Engineering Experiment Station is devoted to the study of problems of special importance to engineering and to manufacturing, railway, mining, and industrial interests, and the stimulation and elevation of engineering education. Approximately fourteen research graduate assistantships with a nominal stipend have been established, open to graduates of approved technical schools and universities. Applicants to whom these graduate assistantships are awarded agree to hold them for two years, devoting one-half their time to the work of the Engineering Experiment Station. At the end of this period, if all requirements have been met, the degree of Master of Science will be conferred. Several additional assistantships are usually maintained by industrial organizations. Applications for graduate assistantships should be made to the Director of the Engineering Experiment Station not later than March 1.

Libraries

The general university library, including the departmental libraries and reading rooms listed below, are located at the University in Urbana. The libraries of the College of Pharmacy and the College of Medicine are in Chicago.

These libraries contain about 1,053,000 volumes and about 277,000 pamphlets. Of these, 1,000,500 books and 269,000 pamphlets are in the libraries at Urbana; the rest are in Chicago. The library at Urbana also contains about 3,700 maps and 10,200 pieces of sheet music. About 8,000 periodicals are currently received, including over 200 newspapers published in Illinois and about 125 foreign language newspapers published in the United States.

The general library of the University is open daily, from 8 a. m. until 10 p. m. and on Sunday from 2:30 p. m. until 5:30 p. m.

In the book stacks are 140 cubicles for the use of faculty members and graduate students.

A number of departmental and college libraries and reading rooms are maintained in the library and in other buildings on the campus; these libraries do not necessarily contain all the books in the respective subjects. In some instances they are primarily for the use of the graduate students and advanced undergraduate students in the departments using the respective buildings. The principal departmental libraries and reading rooms are the following:

Name of Library	*Location*	*Volume*
Philosophy, Psychology, and Education	Library Building	10,10
Classics	Library Building	26,00
Modern Languages	Library Building	8,50
English	Library Building	6,80
History and Political Science	Library Building	17,70
Economics, Sociology, and Commerce	Library Building	4,90
Natural History	Natural History Building	56,30
Law	Law Building	54,70
Architecture, Ricker Library of	Architecture Building	11,90
Agriculture	New Agriculture Building	25,10
Chemistry	Chemistry Building	15,20
Physics	Physics Building	1,60
Mathematics	Mathematics Building	12,00
Engineering	Engineering Hall	36,10
Landscape Architecture	New Agriculture Building	5,00

The library includes most of the bibliographical aids published for the book trade in this and other countries; a Union Card Catalog numbering over 2,500,000 cards, chiefly of books in seven other large American libraries; many printed catalogs of important libraries, e.g., Catalogue of Printed Books in the British Museum, Gesamtkatalog der Preussischen Bibliotheken, and Catalogue Général des livres imprimés de la Bibliothèque Nationale; and many bibliographies of special subjects.

The following brief statements indicate the resources of the library for research in a few subjects selected at random:

Official publications of municipalities number about 32,000 reports, charters and ordinances, issued by over 3,000 American and 300 foreign municipalities and more or less complete files of about 50 municipal periodicals. Systematic attempts are made to secure current publications, especially of Illinois municipalities.

Mathematics numbers 12,000 volumes, about 9,500 dissertations and other pamphlets, and includes files of over 300 periodicals and other serials.

Chemistry includes about 10,100 volumes of bound periodicals, 4,700 other books, 1,500 pamphlets, 7,200 theses, and receives currently 255 journals, most of which are complete sets.

Italian history includes the Cavagna Library, 40,000 volumes, pamphlets and maps, and 138 bundles of manuscripts with typed partial index to families

and places dealt with; much material of Italian local history, biography, and genealogy.

Classical literature, history, and archaeology embraces approximately 30,000 volumes, including complete sets of about 150 journals and serials; the library of Professor Wilhelm Dittenberger, of Halle, 5,600 items acquired in 1907; the library of Professor Johannes Vahlen, of Berlin, 10,000 items acquired in 1913; and a collection of about 17,000 dissertations, reprints, etc.

The Ricker Library of Architecture numbers 11,900 volumes, 10,500 lantern slides, and 9,000 photographs and drawings. It is not only a good working library for faculty and students in architecture, but contains many of the older and rarer works.

Fees and Expenses

Except as noted below, graduate students pay fees as follows:

Matriculation fee	$10.00
Incidental fee, each semester, for residents of Illinois	35.00
All students, not residents of Illinois, pay each semester an incidental fee of	62.50
Incidental fee for students registered for thesis work towards the master's degree on leave of absence	20.00
Graduation fee	10.00
For late registration	5.00
For change in study-list	1.00

All persons on University appointment or on appointment in allied surveys and laboratories in Urbana and the research and educational hospitals in Chicago, eligible for admission to University work, also superintendents, principals, and teachers employed in the public school systems of Illinois and teachers and members of the staff in colleges and universities in this state, when admitted to instruction in the University during the period of their employment, may be permitted to attend University classes for credit, on condition that they register and pay either the regular incidental fees in the Graduate School, or, at their election, fees assessed as follows:

For undergraduate and professional work in the colleges and schools at Urbana, $2.50 a credit hour.

For graduate work at Urbana or Chicago, at the rate of $10 a unit; provided, however, that persons on scholarship or fellowship appointment in the Graduate School, or on University appointment at a salary of $1,600 a year or less, who are registered in the Graduate School, shall be exempt from the payment of such fees, and from laboratory fees, in courses for graduate credit.

All persons shall pay the matriculation and graduation fees.

Table board may be obtained at prices ranging from $5 to $7 a week.

Room rent, single room, ranges from $15 to $25 a month; double room, from $10 to $15 a month, each person.

DEPARTMENTS OF INSTRUCTION

Courses open to graduate students are of two classes. The first class is wholly of graduate grade, and the courses are numbered 100 upwards. The second class includes the courses classified as for graduates and advanced undergraduates. These carry numbers below 100. The courses numbered 100 and upwards are all accepted for major credit. Those of the other group are in many cases accepted for minor credit only. This is especially true of courses which are open to juniors.

All courses have certain prerequisites for admission. Inasmuch as the prerequisite preparation may be gained at other institutions from courses differing from those offering a similar preparation at the University of Illinois, so that a statement of prerequisites as given here would not be understood elsewhere, their description is omitted altogether. However, a student who wishes to enter a particular course must satisfy the department concerned that he has had in some form the prerequisites for admission to the course.

For the convenience of first-year students the credit value of graduate courses is given in units. These values have no significance for second-year and third-year students.

The credit received for "courses for graduates and advanced undergraduates" is in accordance with the regulations of the Graduate School (see page 10).

Students are admitted to graduate standing in agriculture who have had a thorough training in the sciences underlying agriculture, and who are otherwise eligible to the Graduate School, even though their undergraduate course of study lacked to some extent the amount and kind of technical work in agriculture included in the course of study for the bachelor's degree in agriculture at the University of Illinois.

AGRICULTURAL ECONOMICS

Graduate students in agricultural economics may do their work in the general field of agricultural economics or specialize in any one of the following: (1) farm organization and management; (2) land economics; (3) agricultural marketing; and (4) agricultural prices and statistics.

Graduate work in agricultural economics as a major subject is open to students under either of two conditions: (1) the student must have done at least 20 hours of undergraduate work in economics, agricultural economics, business organization and operation, accountancy, history, political science, or sociology, of which at least 12 hours must have been in the field of economics and agricultural economics; or (2) the student must have had a thorough training in the principles of agricultural economics consisting of at least 12 hours credit in economics and agricultural economics, either in connection with or in addition to a course of study in agriculture substantially equivalent to that required for the bachelor's degree in agriculture in this University.

To take agricultural economics as a minor, the student must have had at least 20 hours work in agricultural and economic subjects. Two units in agricultural economics will be accepted as satisfying this requirement.

Graduate students who are making agricultural economics their major are required to take at least one course in advanced economic theory. Where such students are taking two minors in other departments, one of them must be in economics, business organization and operation, accountancy, sociology, history, or political science.

Certain courses given in other departments are closely related to those in agricultural economics. A graduate student whose major is in agricultural economics may be permitted, on approval of the departments concerned, to take such courses as part of his major work. Attention is called to graduate courses in economics, accountancy, business organization and operation, and sociology, as well as those in other departments in the College of Agriculture.

Courses for Graduates

103. Personnel Relationships in Teaching, Research, and Extension Work.—See Animal Husbandry 103 and Agronomy 119. Professor Mumford.

109. Seminar. Thesis Course.—All graduate students majoring in Agricultural Economics must register in Agricultural Economics 109; credit is conditional upon the completion of an acceptable thesis. Once a week; both semesters. *One to two units.* Members of the department.

110. Agricultural Economics Theory.—Twice a week; both semesters. *One unit.* Professor Stewart.

111. Agricultural Prices and Statistics.—Twice a week; both semesters. *One unit.* Associate Professor Working.

112. Agricultural Economics Research.—Credit is conditional upon the completion of an acceptable report of investigation. Once a week; both semesters. *One to two units.* Members of the department.

120. Farm Management Principles and Investigational Methods.—Twice a week; first semester. *One unit.* Professor Case.

135. Problems in the Marketing of Agricultural Products.—Three times a week; second semester. *One unit.*
   (a) Grain, Livestock, and General Agricultural Marketing.—Professor Norton.
   (b) Horticultural Products.—Professor Lloyd.
   (c) Dairy Products.—Assistant Professor Bartlett.

Courses for Graduates and Advanced Undergraduates

10. Economic Relationships of Agriculture.—Three times a week; first semester. Professor Stewart.

11. Agricultural Prices and Statistics.—Three times a week; second semester. Associate Professor Working.

14. Cooperation in Agriculture.—Twice a week; second semester. Assistant Professor Bartlett.

15. Financing Agriculture.—Three time a week; second semester. Professor Norton.

17. Economic History of Agriculture.—Twice a week; first semester.

18. Land Economics.—Three times a week; second semester. Professor Case, Dr. Wills.

22. Types and Systems of Farming.—Required field trip, expense about $3. Three times a week; first semester. Associate Professor Wilcox.

23. Farm Business Analysis.—Required field trip, expense about $5. Three times a week; second semester. Dr. Wills.

24. Farm Operation.—Required field trip, expense about $3. Twice a week; first semester. Dr. Wills.

25. Farm Organization.—Required field trip, expense about $5. Three times a week; second semester. Professor Case, Mr. Ackerman.

26. Farm Administration.—Twice a week; first semester. Professor Case, Mr. Ackerman.

31. Grain Grading and Marketing.—Required inspection trip, expense about $10. Three times a week; first semester. Professors Norton, Pieper.

34. Marketing Dairy Products.—Twice a week; second semester. Assistant Professor Bartlett.

36. Marketing Horticultural Products.—For seniors and graduates specializing in horticulture. Inspection trip required; estimated cost, $12. Three times a week; first semester. Professor Lloyd.

37. Marketing Livestock.—Twice a week; second semester. Associate Professor Ashby.

42. Farm Appraisals.—Local field trips to be arranged; estimated cost, $5. Four times a week; second semester. Members of departments involved.

AGRONOMY

Graduate students may take work in agronomy leading to the M.S. and Ph.D. degrees. They may specialize for either degree in soil fertility, soil physics, soil biology, plant breeding, or crop production.

For either degree, if two minors are chosen, the first should be, and both first and second may be, taken in a department other than agronomy. If only one minor is chosen, it must be in a field outside of the department.

A candidate for the master's degree in agronomy must present an acceptable thesis, and show proficiency in his work as demonstrated by suitable examinations, prescribed by the department.

Fifteen college credits in agronomy and related subjects are prerequisites for a minor, and five additional credits are prerequisites for a major. Students must have had the fundamental work in science, prerequisite to the major and minor fields of study. Those with unusually good training in science may be permitted by the department to waive certain of the above mentioned requirements.

Courses for Graduates

101. Chemical Properties of Soils; Their Relation to Soil Development and Plant Growth.—Twice a week; first semester. *One unit.* Professor DeTurk.

104. Seminar.—Once a week; both semesters. *One-fourth unit.* The Graduate Staff.

112. Theory and Analysis of Plant Breeding Problems.—Three times a week; first semester. *One unit.* Professor Woodworth.

114. Principles Underlying the Production of Crops.—Twice a week; second semester. *One unit.* Professors Burlison, Dungan.

118. Research.—A special problem is chosen by each student. Graduate students writing theses should so indicate in registering in Agronomy 118. Both semesters. *One-half to four units.*

(a) Soils.—Professors Bauer, DeTurk, R. S. Smith.
(b) Crops.—Professors Burlison, Woodworth, Dungan.

119. Personnel Relationships in Teaching, Research, and Extension Work. —See Animal Husbandry 103.

Courses for Graduates and Advanced Undergraduates

7. Crop Production as Affected by Environmental Factors.—Three times a week; first semester. Professors Burlison, Dungan.

10. Genesis, Morphology, Classification, and Geography of Soils.—Three times a week; second semester. Professor R. S. Smith.

11. Rôle of Micro-organisms in Soil Fertility.—Three times a week; first semester. Associate Professor Sears.

13. Soil Productivity, its Variation, Modification, and Maintenance.—Three times a week; second semester. Professor Bauer.

22. Improvement of Farm Crops by Breeding.—Three times a week; second semester. Professor Woodworth, Dr. Bonnett.

29. Principles of Field Plot Experimentation.—Three times a week; first semester. (Given in alternate years; not given in 1937-38.) Professor Woodworth, Mr. Mumm.

30. Metabolism of Soil Micro-organisms.—Three times a week; second semester. (Given in 1937-38 and in alternate years.) Associate Professor Sears.

31. Biological Methods of Soil Investigation.—Three times a week; second semester. (Given in alternate years; not given in 1937-38.) Associate Professor Sears.

32. Physical Methods of Soil Investigation.—Three times a week; first semester. (Given in alternate years; not given in 1937-38.) Dr. Stauffer.

33. Chemical Methods of Soil Investigation.—Three times a week; first semester. (Given in 1937-38 and in alternate years.) Professor DeTurk.

35. Farm Appraisals.—See Agricultural Economics 42.

ANIMAL HUSBANDRY

The department of animal husbandry offers graduate work leading to the degree of Master of Science and the degree of Doctor of Philosophy. For a major or minor for the master's degree the student may specialize in the general field of animal production, or in the special fields of animal genetics, animal nutrition, animal pathology and poultry husbandry. For a major or minor for the doctor's degree he may specialize in animal genetics, the economics of meat production, animal nutrition, and animal pathology. Advanced work in poultry husbandry may be taken for a minor for the doctor's degree.

For registration for a minor in animal husbandry a student must offer at least 15 college credits in the field, including the principles of feeding, the principles of genetics, livestock production and livestock judging, and he must have had an introductory course in organic chemistry. For a major a student must offer at least 5 additional college credits in animal husbandry or in courses related to the major field of specialization. Besides these general requirements, a student must have had the special training required for effective graduate study in the field of his chosen major: For work in animal production, the economics of meat production; for work in poultry husbandry, an introductory course in farm management; for work in animal genetics, at least an introductory course in general zoology; for work in animal nutrition, a satisfactory course in quantitative chemical analysis, and preferably also a course in animal physiology; for work in animal pathology, training in histology, physiology, bacteriology, and hygiene. Attention is also directed to the advisability of in-

cluding in undergraduate preparation for graduate work in any phase of animal husbandry at least introductory training in French or German and in mathematics.

In the case of students with an unusually thorough training in science who wish to pursue graduate work in some special field of animal husbandry from a non-agricultural viewpoint, the department may waive certain of the above requirements.

Students who desire to become candidates for the doctorate and who register for a minor in the general fields of animal production or the economics of meat production must take Animal Husbandry 7 and 41, if they have not taken these courses or their equivalents during their undergraduate training. Such students registering for a major in these general fields must take in addition Animal Husbandry 31, and most students so majoring will find it desirable to register in Animal Husbandry 35.

Courses for Graduates

103. Personnel Relationships in Teaching, Research, and Extension Work.—Organization and administration of research; objects, methods, and the sources of error in experimental work. Open to graduate students in all departments of the College of Agriculture. Once a week; second semester. *One-half unit.* Professor Mumford.

112. Research.—One to three times a week; both semesters. *One-half to two units.* May be taken on Saturday mornings by special arrangement. Investigations along the following lines:

(a) Economic Factors in Meat Production.—Professor Rusk.

(b) Systems of Livestock Farming.—Professor Case.

(c) Animal Pathology.—Professor Graham.

(d) Animal Nutrition.—The chemistry of feeding stuffs; metabolism experiments and biochemical studies connected with the nutrition of farm animals. Professor Mitchell.

(e) Animal Genetics.—Professor Roberts.

(f) Poultry Husbandry.—Professor Card.

117. Animal Genetics.—Two to three times a week; both semesters. *One unit.* Professor Roberts.

118. Animal Nutrition Seminar.—A review of current literature in animal nutrition. Two hours a week; both semesters. *One-half unit.* Professor Mitchell.

119. Laboratory Methods in Animal Nutrition.—Two to five times a week; both semesters. *One-half to one unit.* Professor Mitchell.

120. Laboratory Methods in the Diagnosis of Animal Diseases.—Two to five times a week; both semesters. *One-half to one unit.* Professor Graham.

121. Laboratory Methods in Animal Genetics.—Two to five times a week; both semesters. *One-half to one unit.* Professor Roberts.

Courses for Graduates and Advanced Undergraduates

7. Principles of Animal Nutrition.—Five times a week; first semester. Dr. Hamilton.

22. Advanced Stock Judging.—Five times a week; first semester. Members of the department.

24. Meat Judging and Special Problems.—Two to five times a week; first semester. Associate Professor Bull.

25. Beef Production.—Three times a week; first semester. Professor Rusk, Associate Professor Snapp.

26. Pork Production.—Three times a week; first semester.

27. Sheep Husbandry.—Three times a week; second semester.

28. History of Breeds of Livestock.—Three times a week; second semester. Professor Edmonds and other members of the department.

31. Advanced Course in Animal Nutrition.—Three times a week; second semester. Professor Mitchell.

33. Horse Production.—Three times a week; second semester. Professor Edmonds, Mr. Crawford.

35. Animal Hygiene, Sanitation, Contagious Diseases of Farm Animals.—Twice a week; second semester. Professor Graham, Dr. Boley.

39. Poultry Breeding and Improvement.—Three times a week; first semester. Professor Card.

40. Economics of Poultry Production.—Three times a week; second semester. Professor Card.

41. Animal Genetics.—Three times a week; second semester. Professor Roberts.

ARCHITECTURE AND ARCHITECTURAL ENGINEERING

The prerequisite for graduate work in the Department of Architecture is the equivalent of the undergraduate courses required at the University of Illinois for the bachelor's degree in the department in the branches of the subjects in which registration is desired.

Courses for Graduates

101. Architectural Construction.—Theory and design. Twice a week; both semesters. *One-half to two units.* Professor Palmer.

103. Architectural Construction.—Special problems. Twice a week; both semesters. *One-half to two units.* Professor Morgan.

104. Architectural Design.—Advanced course. Twice a week; both semesters. *One to three units.* Professor Deam.

105. Architectural Practice.—Research in special topics. Once a week; both semesters. *One-fourth to one-half unit.* Professor Provine.

106. Architectural History.—Special research. Twice a week; both semesters. *One-half to two units.* Professor Newcomb.

Courses for Graduates and Advanced Undergraduates

15. History of Architecture.—Medieval architecture. Twice a week; first semester. Assistant Professor Van Derpool.

16. History of Architecture.—Continuation of 15. Twice a week; second semester. Assistant Professor Van Derpool.

17. History of Architecture.—Renaissance. Twice a week; first semester. Assistant Professor Van Derpool.

18. History of Architecture.—Modern architecture. Twice a week; second semester. Associate Professor O'Donnell.

35-36. Architectural Design (Intermediate).—Four times a week; both semesters. Assistant Professors Scheick, Love.

37-38. Architectural Design (Advanced).—Six times a week; both semesters. Professor Deam, Mr. Keith.

47. Steel Construction.—Lectures and laboratory. Five times a week; first semester. Professor Morgan.

48. Steel Construction.—Continuation of 47. Five times a week; second semester. Professor Morgan.

57. Reinforced Concrete.—Theory. Three times a week; first semester. Professor Palmer.

58. Reinforced Concrete.—Design. Continuation of 57. Three times a week; second semester. Professor Morgan.

68. Specifications.—Three times a week; both semesters. Professor Provine.

83. Office Practice.—Twice a week; first semester. Professor Provine.

ASTRONOMY

The prerequisites for graduate study in astronomy are mathematics through calculus, a year's course in descriptive astronomy, and a course in college physics.

Courses for Graduates

101. Seminar.—Three times a week; both semesters. *One unit.* Professor Baker.

103. Celestial Mechanics.—Three times a week; both semesters. *One unit.* Professor Baker.

Courses for Graduates and Advanced Undergraduates

7. Celestial Mechanics.—Three times a week; second semester. Professor Baker.

14. Observational Astronomy.—Three times a week; first semester. Professor Baker.

15. Geodetic Astronomy.—Three times a week; first semester. Professor Baker.

BACTERIOLOGY

Students electing bacteriology as a major study must have had at least 10 semester hours of bacteriology and 15 semester hours of some other physical or biological science. Before receiving a degree a student must have had work equivalent to courses 20, 8, 26, 103, and 107; candidates for the doctor's degree will be held responsible for a general knowledge of the subject as applied to plant pathology, dairy husbandry (dairy bacteriology), and soil biology. Courses in these subjects are listed under their respective departments and will be counted, after conference with adviser, toward the requirements for the doctor's degree.

In addition to the usual examinations in courses, each candidate for the master's degree will be required to pass a general written examination toward the close of the second semester of residence.

Candidates for the doctor's degree with a major study in another field than bacteriology, who elect a first or second minor in bacteriology, must offer a minimum of three units for the first minor and two and one-half units for the second minor selected from the courses offered in this department, or, for satisfactory reasons, certain courses in the departments mentioned above. These courses must include course 103 and one advanced laboratory course in the department of bacteriology.

NOTE: The attention of students is called also to courses in bacteriology offered in other departments. Certain of these courses must be elected toward requirements for advanced degrees after conference with adviser.

Courses for Graduates

103. PHYSIOLOGY OF BACTERIA.—Twice a week; first semester. *One unit.* Professor TANNER.

107. RESEARCH.—For those students who are taking a major in bacteriology either for the doctor's degree or master's degree. Both semesters. *One-half to four units.* Professor TANNER, Assistant Professor WALLACE.

118a–118b. CURRENT LITERATURE.—Required of all graduate students majoring in bacteriology. Once a week; both semesters. *One-fourth unit.* Professor TANNER.

Courses for Graduates and Advanced Undergraduates

8. FOOD BACTERIOLOGY.—Water, sewage, and food bacteria. Five times a week; second semester. Professor TANNER, Dr. CLARK.

10. EPIDEMIOLOGY.—Twice a week; second semester. Assistant Professor WALLACE.

20. GENERAL BACTERIOLOGY.—For seniors and graduate students. Five times a week; first semester. Assistant Professor WALLACE.

26. PATHOGENIC BACTERIOLOGY.—Five times a week; first semester. Assistant Professor WALLACE.

BOTANY

Candidates for advanced degrees in botany must offer for admission at least 20 hours in botany inclusive of courses 2 or 12 and 3, or 15 hours in botany and 5 hours in a related subject acceptable to the department. Graduate students who elect botany for minor credit must offer 15 hours in botany, or 10 hours in botany and 5 hours in a related subject acceptable to the department.

The department wishes to call the attention of graduate students to courses in agronomy and soils, bacteriology, chemistry, entomology, geography, geology, horticulture, mathematics, physics, physiology, and zoology which are available to advanced students and offer a broad foundation for the different phases of botanical work. The practical work in plant sciences in the College of Agriculture and the Experiment Station offers unusual facilities to the graduate student. Joint majors may be arranged in botany and agronomy.

Courses for Graduates

110. BOTANICAL DISCUSSIONS.—Required of all graduate students and of members of the instructional staff. Once a week; both semesters. No credit.

112. DISCUSSIONS IN PLANT MORPHOLOGY.—Once a week; both semesters. *One-fourth unit.* Professor BUCHHOLZ.

113. DISCUSSIONS IN PLANT PHYSIOLOGY.—Once a week; both semesters. *One-fourth unit.* Professor HOTTES.

117. DISCUSSIONS IN PLANT PATHOLOGY AND MYCOLOGY.—Once a week; both semesters. *One-fourth unit.* Professor STEVENS.

118. DISCUSSIONS IN PLANT ECOLOGY.—Once a week; both semesters. *One-fourth unit.* Associate Professor VESTAL.

Research Courses

120. PLANT MORPHOLOGY.—Once or twice a week; both semesters. *One-half to two units.* (Botany 112 to be taken concurrently.) Professor BUCHHOLZ.

130. Plant Physiology.—Once or twice a week; both semesters. *One-half to two units.* (Botany 113 to be taken concurrently.) Professor Hottes.

170. Plant Pathology or Mycology.—Once or twice a week; both semesters. *One-half to two units.* (Botany 117 to be taken concurrently.) Professor Stevens.

180. Plant Ecology or Geography.—Once or twice a week; both semesters. *One-half to two units.* (Botany 118 to be taken concurrently.) Associate Professor Vestal.

Courses for Graduates and Advanced Undergraduates

20. Cytology.—Once or twice a week; second semester. (Given in 1937-38 and in alternate years.) Professor Buchholz.

33. Plant Physiology.—Growth, and the effect of environment on growth. Once or twice a week; first semester. Professor Hottes.

34. Plant Physiology.—Respiration, and the effects of the environment and food on energy release. Once or twice a week; second semester. Professor Hottes.

41. Algae and Bryophytes.—Morphology and classification. Once or twice a week; second semester. Dr. Hague.

43. Pteridophytes.—Comparative morphology. Once or twice a week; first semester. (Given in alternate years; not given in 1937-38.) Professor Buchholz.

44. Spermatophytes.—Comparative morphology. Once or twice a week; second semester. (Given in alternate years; not given in 1937-38.) Professor Buchholz.

45. Plant Histology, Anatomy, and Technique.—Once or twice a week; first semester. Professor Buchholz.

46. Heredity and Evolution.—The cell in inheritance, environment, adaptation, and evolution. Once or twice a week; first semester. (Given in 1937-38 and in alternate years.) Professor Buchholz.

55. Plant Geography of North America.—Regional divisions; climate, soil, topography, vegetation, vegetational history. Once or twice a week; first semester. (Given in 1937-38 and in alternate years.) Associate Professor Vestal.

56. Plant Geography.—Plants and vegetation of continents other than North America; geographic relations of floras. Once or twice a week; first semester. (Given in alternate years; not given in 1937-38.) Associate Professor Vestal.

60. Advanced Systematic Botany.—Phylogenetic study of flowering plants. Relationship of the principal orders and families, rules of taxonomy and the identification of species. Once or twice a week; first semester. (Given in alternate years; not given in 1937-38.) Dr. Fuller.

72. Mycology.—Structure, classification, and identification of fungi, including those of economic importance. Once or twice a week; first semester. Professor Stevens.

79. Research Methods in Plant Pathology.—The isolation, culture, and identification of pathogenic fungi. Once or twice a week; second semester. Professor Stevens.

80. Plant Ecology: Environment.—Analysis of the environmental complex; responses of plants to particular factors. Once or twice a week; second semester. (Given in 1937-38 and in alternate years.) Associate Professor Vestal.

81. Plant Ecology.—Relation to environment and distribution of individual plants and of vegetation (communities). Once or twice a week; first semester. Associate Professor Vestal.

88. PLANT ECOLOGY: PLANT COMMUNITIES.—Characteristics, composition, and classes of vegetation-units. Once or twice a week; second semester (Given in alternate years; not given in 1937-38.) Associate Professor VESTAL.

BUSINESS ORGANIZATION AND OPERATION
(Including Accountancy and Business Law)

ACCOUNTANCY

Accountancy may be taken as a major for the degree of Master of Science or Doctor of Philosophy. A student registering in accountancy as a major must have the equivalent of 15 university credits in accountancy and also at least one course each in principles of economics and finance. One desiring to pursue accountancy as a minor must present similar courses, with 12 instead of 15 credit hours in accountancy as a minimum. Accountancy 4a is a prerequisite for 106; 3b for 110; 13 for 113; and 20 for 120.

Courses for Graduates

101. CONCEPTS AND PRINCIPLES.—Twice a week; first semester. *One unit.* Professor LITTLETON.

103. INCOME DETERMINATION.—Twice a week; second semester. *One unit.* Professor LITTLETON.

104. ACCOUNTING SYSTEMS.—Twice a week; both semesters. *One unit.* Professor SCOVILL.

106. SURPLUS AND DIVIDENDS.—Twice a week; first semester. *One unit.* Professor LITTLETON.

107. ACCOUNTING HISTORY.—Twice a week; second semester. *One unit.* Professor LITTLETON.

113. GOVERNMENTAL ACCOUNTING.—Twice a week; second semester. *One unit.* Professor MOREY.

120. INCOME TAX DEVELOPMENT.—Twice a week; first semester. *One unit.* Professor FILBEY.

129. THESIS.—Once a week; both semesters. *One unit.* Professor LITTLETON and members of the staff.

Courses for Graduates and Advanced Undergraduates

3a. ADVANCED ACCOUNTING.—Three times a week; either semester. Professor FILBEY, LITTLETON.

3b. AUDITING.—Three times a week; either semester. Professor FILBEY.

4a. COST ACCOUNTING.—Twice a week; either semester. Professor SCHLATTER

4b. ACCOUNTING SYSTEMS.—Twice a week; either semester. Associate Professor BAILY.

5a–5b. C.P.A. PROBLEMS.—Three times a week; both semesters. Professor SCOVILL.

13. GOVERNMENTAL ACCOUNTING.—Twice a week; either semester. Professor MOREY, Assistant Professor HACKETT.

20. INCOME TAX PROCEDURE.—Twice a week; second semester. Professor FILBEY.

30. BUDGETS AND ACCOUNTING CONTROL.—Three times a week; either semester Associate Professor THEISS.

BUSINESS ORGANIZATION AND OPERATION

Work may be done in the field of business organization and operation for a major or a minor for the M.S. degree, and for a minor for the doctorate. To

lo major work in this field, the student must have completed an undergraduate urriculum equivalent to that of the College of Commerce and Business Administration. To do minor work, he must have had at least five semester hours' redit in the principles of economics, also Business Organization and Operation and 2 or the equivalent. Business Organization and Operation 1 is a prerequisite for 104.

Courses for Graduates

02. Marketing Research and Policies.—Twice a week; both semesters. *One unit.* Professor Converse.

04. Scientific Management.—A study of modern management methods and procedures, particularly as they apply to industrial enterprises. Twice a week; both semesters. *One unit.* Professor Anderson.

07. Sales Campaigns.—Twice a week; both semesters. *One unit.* Professor Russell.

29. Thesis.—Time to be arranged; both semesters. *One unit.* Professor Russell and others.

Courses for Graduates and Advanced Undergraduates

3. Retail and Chain Store Organization and Operation.—Three times a week; either semester. Dr. Whitlo.

4. Management in Manufacturing.—Three times a week; first semester. Professor Anderson.

7. Salesmanship.—Twice a week; either semester. Assistant Professor Beach, Dr. Jones.

8. Advertising.—Three times a week; either semester. Professor Russell.

9. Trade Associations and Commercial Organizations.—Twice a week; second semester. Dr. Bruce.

14. The Technique of Executive Control.—Three times a week; second semester. Professor Anderson.

17. Problems in Sales Administration.—Twice a week; either semester. Assistant Professor Beach.

18. Advertising Campaigns.—Three times a week; second semester. Professor Russell.

20. Credits and Collections.—Three times a week; either semester. Dr. Huegy.

22. Marketing Research and Policies.—Twice a week; second semester. Professor Converse.

BUSINESS LAW

Course for Graduates and Advanced Undergraduates

10. Law of Security Relations and Banking.—Three times a week; either semester. Associate Professor Dillavou.

CERAMIC ENGINEERING

This department offers graduate work leading to the degrees of Master of cience in Ceramics, Master of Science in Ceramic Engineering, Doctor of hilosophy in Chemistry (Ceramic Chemistry), and Doctor of Philosophy in ngineering.

The prerequisite for majoring in graduate work in ceramics or ceramic engineering is proficiency in the undergraduate courses required for the degree of

Bachelor of Science in the branch of the subject in which registration is desired or substantial equivalents.

Candidates for the degree of Doctor of Philosophy in Chemistry (Ceramic Chemistry) must have had the equivalent of at least 25 semester hours of satisfactory courses in general, analytical, physical, and organic chemistry; also calculus, one year of college physics, one semester of optical mineralogy, and at least 18 semester hours or their equivalent in acceptable ceramic courses.

Courses for Graduates

101a-101b. The Chemistry of the Compounds of Silicon.—Twice a week; both semesters. *One unit.* Professor Parmelee.

102. General Technology of the Clay Industries.—Twice a week; both semesters. *One to two units.*

(a) Ceramic Materials and Processes.—Professor Parmelee.

(b) Drying and Firing Processes.—Professor Hursh.

(c) Enamels and Equilibrium Studies.—Professor Andrews.

103. Chemistry of Silicates.—Laboratory to supplement Ceramic Engineering 101, which must precede or accompany it. Both semesters. *One to two units.* Professor Parmelee.

104. Technology of Glass.—Twice a week; second semester. *One to two units.* Professor Parmelee.

105. Methods of Ceramic Research.—Twice a week; second semester. *One unit.* Professor Parmelee.

106. Research.—Professors Parmelee, Hursh, Andrews.

Courses for Graduates and Advanced Undergraduates

5. Ceramic Bodies.—Five times a week; first semester. Professor Parmelee.

7. Structural Clay Products.—Three times a week; first semester. Professor Andrews.

8. Glass Technology.—Twice a week; second semester. Professor Parmelee.

10. Cements.—Twice a week; second semester. Dr. Morgan.

11. Drying Clay Products.—Three times a week; second semester. Professor Hursh.

14. Glasses and Glazes.—Three times a week; second semester. Professor Parmelee.

16. Enamels.—Three times a week; second semester. Professor Andrews.

17. Enamels Laboratory.—Three times a week; first semester. Professor Andrews.

18. Ceramic Microscopy.—Three times a week; first semester. Dr. Morgan.

20. Refractory Materials.—Twice a week; second semester. Professor Andrews.

22. Kilns and the Burning of Clay Products.—Three times a week; first semester. Professor Hursh.

23. Dryer and Kiln Design.—Twice a week; first semester. Professor Hursh.

24. Ceramic Engineering Design.—Three times a week; second semester. Professor Hursh.

28. Pyrochemical Problems.—Twice a week; second semester. Professor Andrews.

CHEMISTRY

(Including Chemical Engineering)

Graduate students whose major subject is in some department other than hemistry, before taking graduate work for credit in this department, must have ad the equivalent of 15 university credits in chemistry, and the ground covered hould include satisfactory work in general chemistry and in qualitative and uantitative analysis and elementary organic chemistry. Such students are ad- ised to make selections from the following courses: Chemistry 40, 41, 42, 43, 7, 36 and 37, 50a, 60a, 15a, 16a, and 29b. Courses of a more special nature ill not as a rule be accepted for graduate work unless preceded by one of the ourses above. Graduate students who are candidates for an advanced degree n chemistry or chemical engineering must have had the equivalent of 25 univer- ity credits in chemistry properly distributed.

Graduate students whose major subject is in some department other than hemistry and who intend to take a first minor in chemistry or any branch of hemistry toward the Ph.D. degree must include among the courses taken, hemistry 40 and 41, or must have had the equivalent.

Graduate students who are candidates for the A.M. or M.S. degree in chem- stry must include in the courses taken Chemistry 40 and 41 or must have had he equivalent. Graduate students who are candidates for the Ph.D. degree in ny branch of chemistry or chemical engineering must include among their ourses Chemistry 40, 41, 42, and 43 or must have had the equivalent.

Students who intend to take graduate work in chemistry or chemical engi- neering should include in their undergraduate preparation at least the equiva- ent of one full year of physics, one year of French, one year of German, and nathematics through differential and integral calculus. Any student without hese subjects may enter the Graduate School but will be required to spend part f his time in residence on the above-mentioned subjects.

Candidates for the degree of Ph.D. in chemical engineering must have ompleted an undergraduate training in chemical engineering comparable to hat offered in the chemical engineering curriculum at the University of Illinois.

Courses for Graduates

Inorganic Chemistry

01a–101b. Inorganic Chemistry.—The less familiar elements and their relationship in the periodic system. Lectures; recitations. Twice a week; both semesters. *One-half unit.* Professor Hopkins.

02a–102b. Inorganic Chemistry.—(Laboratory.) Inorganic preparations and qualitative analysis of the less familiar elements. To accompany or follow Chemistry 101a–101b. One to three times a week; both semesters. *One-fourth to three-fourths unit.* Professor Hopkins.

05a–105b. Inorganic Chemistry.—(Seminar.) Current literature. (Required of all students whose major is inorganic chemistry.) Once a week; both semesters. *One-fourth unit.* Professor Hopkins.

06a. Inorganic Chemistry.—Special topic: Chemistry of inorganic pigments. Twice a week; first semester. *Three-fourths unit.* Dr. Nicholson.

06b. Inorganic Chemistry.—Special topic: The mechanism of inorganic reactions. Twice a week; second semester. *Three-fourths unit.* Assistant Professor Copley.

Analytical Chemistry

123a. Qualitative Analysis and Microanalysis.—The principles and method of analytical chemistry; theory of solutions. Lectures. Twice a week first semester. *One-half unit.* Associate Professor Reedy.

123c. Qualitative Analysis and Microanalysis.—Laboratory, optional, to ac company Chemistry 123a. Special topic: Microanalysis. One to thre times a week; first semester. *One-fourth to three-fourths unit.* Asso ciate Professor Reedy.

124b. Quantitative Analysis.—A modern survey of advanced principles, cal culations, experimental methods and applications. Lectures. Twice a week; second semester. *One-half unit.* Associate Professor Smith.

124d. Quantitative Analysis.—Laboratory, optional, to accompany Chemistr 124b. One to three times a week; second semester. *One-fourth t three-fourths unit.* Associate Professor Smith.

125a-125b. Analytical Chemistry.—(Seminar.) Special topics in analytica chemistry. (Required of all students taking a major or minor in ana lytical chemistry.) One to three times a week; both semesters. *One fourth to one unit.* Professor Clark.

126a. Quantitative Instrumental and Chemical Methods of Analysis in Chemical Research.—(Ultimate bomb analysis, gas density, polarim etry, refractometry, spectrophotometry, colorimetry, microscopy, etc.) Lectures. Twice a week; first semester. *One-half unit.* Associate Pro fessor Englis.

126c. Quantitative Instrumental and Chemical Methods of Analysis in Chemical Research.—Laboratory, optional, to accompany Chemistr 126a. One to three times a week; first semester. *One-fourth to three fourths unit.* Associate Professor Englis.

127a–127b. Applied X-rays.—Lectures. Twice a week; both semesters. *One-hal unit.* Professor Clark.

127c–127d. Applied X-rays.—Laboratory, optional, to accompany Chemistr 127a–127b. One to three times a week; both semesters. *One-fourth t one-half unit.* Professor Clark.

Organic Chemistry

132b. Organic Chemistry.—Valence, polymers, terpenes, sterols, alkaloids, recen developments. Twice a week; second semester. *Three-fourths unit.* Professor Shriner.

133a. Organic Chemistry.—Optical isomerism, cis-trans isomerism, tautomerism chemistry of the carbohydrates, etc. Twice a week; first semeste *Three-fourths unit.* Professor Adams.

134. Organic Chemistry.—(Laboratory.) Advanced organic synthesis. Two t four times a week; both semesters. *One-half to one unit.* Professor Fuson, Shriner.

135a–135b. Organic Chemistry.—(Seminar.) Current literature. (Required o all students whose major is organic chemistry.) Once a week; both se mesters. *One-fourth unit.* Professor Adams.

136a. Organic Chemistry.—Lectures and laboratory work on newer methods i organic laboratory procedure. Twice a week; first semester. *Three fourths unit.* Professor Shriner.

Physical Chemistry

144a-144b. Physical Chemistry.—Kinetic theory, statistical mechanics, molecu lar dynamics. Lectures. Twice a week; both semesters. *Three-fourth unit.* Dr. Wall.

145a–145b. Physical Chemistry.—(Seminar.) Recent development in physical chemistry. Twice a week; both semesters. *Three-fourths unit.* Professor Rodebush and staff.

Biochemistry

150b. Biochemistry.—Chemistry of intermediary metabolism. Lectures; discussions; readings. Twice a week; second semester. *Three-fourths unit.* Professor Rose.

152a-152b. Biochemistry.—Difficult biochemical preparations; chiefly laboratory. One to five times a week; both semesters. *One-half to one unit.* Professor Rose.

155a-155b. Biochemistry.—(Seminar.) Current literature. (Required of all students whose major is biochemistry.) Twice a week; both semesters. *Three-fourths unit.* Professor Rose.

Chemical Engineering

160a-160b. Advanced Chemical Engineering.—Advanced work on unit operations and processes. Lectures. Twice a week; both semesters. *One-half unit.* Professor Keyes.

161a–161b. Chemical Plant Design.—Calculations and layout of equipment for recently developed processes. Twice a week; both semesters. *One-half unit.*

165a-165b. Chemical Engineering.—(Seminar.) Once a week; both semesters. *One-fourth unit.* Professor Keyes and staff.

Sanitary Chemistry

185a-185b. Chemistry of Water Treatment.—(Seminar.) Special problems and new developments in sanitary chemistry. Once a week; both semesters. *One-fourth to one and one-fourth units.* Professor Buswell.

Miscellaneous

190a–190b. Research.—A thesis is usually required of students taking the master's degree and is always required of students taking the degree of Doctor of Philosophy. Both semesters. Work may be taken in the following subjects:

Physical and Electrochemistry.—Professor Rodebush, Associate Professor Phipps, Assistant Professor Copley.

Inorganic Chemistry.—Professor Hopkins, Associate Professor Reedy, Assistant Professors Audrieth, Bailar, Copley.

Analytical Chemistry.—Professor Clark, Associate Professors Reedy, Smith, Englis.

Applied X-rays.—Professor Clark.

Food Chemistry.—Associate Professor Englis.

Phyto-Chemistry.—Associate Professor Englis.

Organic Chemistry.—Professors Adams, Marvel, Fuson, Shriner.

Water Chemistry.—Professor Buswell.

Colloid Chemistry.—Professor Buswell.

Zymo-Chemistry.—Professor Buswell.

Biochemistry.—Professor Rose, Dr. Carter.

Chemical Engineering.—Professor Keyes, Associate Professor Johnstone, Assistant Professor Swann.

Ceramic Chemistry.—Professor Parmelee.

Non-aqueous Solvents.—Assistant Professor Audrieth.

192a. Chemical Literature and Reference Work.—Once a week; first semester. *One-fourth unit.* Dr. Bartow.

Courses for Graduates and Advanced Undergraduates

Inorganic Chemistry

15a. Inorganic Chemistry. — The common elements; periodic relationship; preparation and application of the common elements and compounds. Lectures; recitations. Twice a week; first semester. Dr. Reed.

16a. Inorganic Chemistry.—(Laboratory.) Preparation of the less easily produced inorganic compounds. Twice a week; first semester. Dr. Reed.

Analytical Chemistry

25b. Survey of Analytical Chemistry.—An intensive review of the fundamental principles and procedures of qualitative and quantitative analysis. Three times a week; second semester. Associate Professor Reedy.

27. Special Methods and Instruments in Quantitative Analysis.—Three times a week; both semesters. Associate Professor Smith.

29b. Food Analysis.—Quantitative organic analysis of food products; alcohols, carbohydrates, fats and oils, cereals, nitrogenous bodies, preservatives and colors. Six times a week; second semester. Associate Professor Englis.

Organic Chemistry

36. Organic Chemistry.—(Second course.) Lectures and recitations. Three times a week; both semesters. Professors Fuson, Marvel.

37. Organic Chemistry.—(Laboratory.) Organic synthesis. To accompany Chemistry 36. Twice a week; both semesters. Professor Fuson.

38. Qualitative Organic Analysis.—Identification of pure organic compounds and mixtures. Twice a week; both semesters. Professors Shriner, Fuson.

Physical Chemistry

40. Elementary Physical Chemistry.—Three times a week; both semesters. Professor Rodebush, Associate Professor Phipps.

41. Elementary Physical Chemistry.—(Laboratory.) To accompany Chemistry 40. Once a week; both semesters. Professor Rodebush, Associate Professor Phipps, and assistants.

42. Elementary Physical Chemistry.—Three times a week; both semesters. Associate Professor Phipps.

43. Elementary Physical Chemistry.—(Laboratory.) Once a week; both semesters. Associate Professor Phipps and assistants.

44a–44b. Advanced Physical Chemistry.—Thermodynamics and free energy calculations. Atomic structure. Twice a week; both semesters. Professor Rodebush, Associate Professor Phipps.

49b. Chemistry of Colloids.—Lectures and demonstrations. Preparation and properties of colloids. Special apparatus and technique employed in colloid chemistry. Three times a week; second semester. Professor Buswell and assistant.

Biochemistry

50a. Biochemistry.—Proteins, fats, and carbohydrates; tissues, digestion, intestinal putrefaction, and feces; quantitative analysis of gastric contents, blood, milk, and urine. Lectures; laboratory. Five times a week; first semester. Professor Rose, Dr. Carter, and assistants.

51b. Problems of Metabolism.—Micro-methods of blood and urine analysis and their application. Lectures; laboratory. Three times a week; second semester. Dr. Carter and assistants.

Chemical Engineering

60a. Chemical Technology.—The survey of important unit processes and recent developments in the chemical industry. Lectures and laboratory. Four times a week; first semester. Associate Professor Johnstone.

61a-61b. Principles of Chemical Engineering.—The application of scientific principles to the unit operations of chemical engineering. Lectures; laboratory. Four times a week; both semesters. Assistant Professor Comings.

62a. Principles of Research and Development.—The fundamental methods used in research and development in chemical industry. Twice a week; first semester. Professor Keyes.

62b. Economics of Chemical Engineering.—Economic principles applied to chemical industry. Twice a week; second semester. Professor Keyes.

63b. Introduction to Chemical Engineering.—Three times a week; second semester. Assistant Professor Comings.

64b. High Pressure Reactions.—Processes and calculations. Twice a week; second semester.

65b. Chemical Engineering Calculations.—Three times a week; second semester. Associate Professor Johnstone.

67a-67b. Evaporation.—Lectures. Twice a week; both semesters.

68a. Mechanical Separations.—Lectures. Twice a week; first semester.

70b. Humidification and Drying.—Lectures. Twice a week; second semester.

71b. Distillation.—Lectures. Twice a week; second semester.

Sanitary Chemistry

86a. Chemistry of Water Treatment.—Lectures, demonstrations, field trips. Methods for determining water quality. Special water requirements of industries. Chemistry of water conditioning for municipal and industrial use. By-product recovery from industrial and other wastes. Three times a week; first semester. Professor Buswell.

Miscellaneous

95a. History of Science with Particular Reference to Chemistry.—Lectures; reading. Twice a week; first semester. Dr. Bartow.

CIVIL ENGINEERING

The prerequisite for graduate work in civil engineering is the equivalent of the undergraduate course required for the degree of Bachelor of Science in civil engineering in the branches of the subject in which registration is desired.

Courses for Graduates

101. Water Supply.—Design, pumping machinery, administration, operation. Twice a week; first semester. *One unit.* Professor Babbitt.

102. Sewerage.—General sewerage design and construction, sewerage systems, hydraulics of sewers. Twice a week; second semester. *One unit.* Professor Babbitt.

103. Highway Engineering.—Highway transportation, airport design, street layouts, regional plans, and pavements for cities. Twice a week; first semester. *One unit.* Professor Crandell.

104. Municipal Engineering.—City finances and budgets, the work of the city manager and city engineer, zoning, play grounds and parks, street

cleaning; smoke prevention, and fire prevention. Twice a week; second semester. *One unit.* Professor CRANDELL.

105. REINFORCED CONCRETE DESIGN.—Theories of action of beams, slabs and columns of reinforced concrete. Codes and specifications and their influence on design. Effect of continuity. Twice a week; first semester. *One unit.* Professor SHEDD.

106. STRUCTURAL THEORY AND DESIGN.—General theory of continuity. Moment distribution. The column analogy. Rigid frame bridges and buildings. Fixed and continuous arches. Classification of structures from viewpoint of design. Twice a week; first semester. *One or two units.* Professor SHEDD.

107. STEEL DESIGN.—Design of steel members. Codes and specifications for buildings. Riveted and welded connections. Evolution of bridge specifications. Loads and working stresses. Economic proportions. Twice a week; second semester. *One unit.* Professor SHEDD.

108. STRUCTURAL THEORY AND DESIGN.—Statically indeterminate trusses. Continuous trusses. Steel arches. Secondary stresses. Suspension bridges. Long span roofs. Skeleton steel buildings. Twice a week; second semester. *One or two units.* Professor SHEDD.

109. PUBLIC HEALTH ENGINEERING.—Design of water purification works and principles of sanitation. Twice a week; first semester. *One unit.* Professor BABBITT.

110. SEWAGE DISPOSAL, WASTES DISPOSAL, AND GENERAL SANITATION.—Principles and design of sewage treatment and waste disposal works. Twice a week; second semester. *One unit.* Professor BABBITT.

112. MASONRY CONSTRUCTION.—Design and construction of dams, retaining walls, abutments and piers, culverts, grain elevators, and bins. Twice a week; first semester. *One-half to one and one-half units.* Professor HUNTINGTON.

113. FOUNDATIONS.—Investigation of sites, soil mechanics, spread footings, pile foundations, cofferdams, deep foundations. Twice a week; second semester. *One unit.* Professor HUNTINGTON, Assistant Professor BAUER, Dr. NEWMARK.

114. ANALYTICAL STUDY OF STRUCTURAL STEEL MEMBERS.—Twice a week; second semester. *One unit.* Professor WILSON.

120. HIGHWAY TRAFFIC, TRANSPORT, AND SAFETY.—Traffic growth, characteristics, surveys, regulations, and signaling. Private and commercial transportation by automobile, bus, and truck. Transport organization and regulation. Accident surveys, analysis, and prevention. Twice a week; second semester. *One unit.* Associate Professor WILEY.

130. HYDROLOGY.—Precipitation, evaporation, transpiration, run-off, stream flow regulation, flood control. Twice a week; first or second semester. *One unit.* Professor PICKELS.

131. WATER POWER.—Preliminary investigations, selection of site, storage requirements, structures, machinery, etc. Twice a week; second semester. *One unit.* Professor DOLAND.

140. SPECIAL PROBLEMS.—Individual investigations of various phases of civil engineering. First or second semester. *One-half to two units.* Members of the department.

198. THESIS.—First or second semester. *One to two and one-half units.* Members of the department.

Courses for Graduates and Advanced Undergraduates

67-68. STATICALLY INDETERMINATE STRUCTURES.—The elastic theory and its applications in statically indeterminate structures. Three times a week; both semesters. Professor SHEDD.

THE CLASSICS

THE DEGREE OF MASTER OF ARTS IN THE CLASSICS.—The major may be either Latin or Greek.

THE DEGREE OF DOCTOR OF PHILOSOPHY IN THE CLASSICS.—The degree is given in classical philology. Major work may be taken in either Latin or Greek, but whichever language is taken as a major, the other must be taken as a first minor.

GREEK

Preparation for first-year graduate work in Greek should include at least two years of preparatory Greek, two years of college Greek, and two years of college Latin. A reading knowledge of French and German is important for candidates in this subject. The study of history and philosophy is especially recommended.

Courses for Graduates

106a. GREEK DRAMA: TRAGEDY.—Twice a week; first semester. *One unit.* Associate Professor PERRY.

110. BIBLIOGRAPHY AND CRITICISM.—(Thesis course; the same as Latin 110.) Once a week; both semesters. *One unit.* Professor CANTER, Associate Professor FORBES.

120. THEOCRITUS.—Twice a week; second semester. *One unit.* Associate Professor PERRY.

Courses for Graduates and Advanced Undergraduates

6. THUCYDIDES AND PLATO.—Three times a week; first semester. Mr. ZICKGRAF.

8. GREEK ORATORY.—Three times a week; second semester. Mr. ZICKGRAF.

18. GREEK ARCHAEOLOGY.—Twice a week; first semester. Mr. ZICKGRAF.

LATIN

Preparation for first-year graduate work in Latin should include at least two years of preparatory Latin and four years of college Latin. A reading knowledge of French and German is important. Some acquaintance with Greek is highly desirable, and the study of history and philosophy is especially recommended.

Courses for Graduates

101. LATIN EPIGRAM.—Twice a week; second semester. *One unit.* Professor CANTER.

102. ROMAN ORATORY.—Twice a week; first semester. *One unit.* Professor CANTER.

110. BIBLIOGRAPHY AND CRITICISM.—(Thesis course; the same as Greek 110.) Once a week; both semesters. *One unit.* Professor CANTER, Associate Professor FORBES.

118. LATIN ROMANCE.—Twice a week; second semester. *One unit.* Associate Professor PERRY.

Courses for Graduates and Advanced Undergraduates

10. LATIN COMPOSITION.—Twice a week; second semester. Associate Professor PERRY.

18. ROMAN ARCHAEOLOGY.—Twice a week; second semester. Mr. ZICKGRAF.

21. TACITUS AND JUVENAL.—Three times a week; first semester. Professor CANTER.

22. MARTIAL, SUETONIUS, AND APULEIUS.—Three times a week; second semester. Professor CANTER.

DAIRY HUSBANDRY

A graduate student may elect dairy husbandry as his major subject for the degree of Master of Science or Doctor of Philosophy.

For either degree a first minor must be taken outside the department, preferably outside the college. If a second minor is elected it may with proper approval be chosen in the department.

Candidates for advanced degrees in dairy husbandry must have had adequate training in collegiate courses in dairy husbandry. In addition, depending upon his field of specialization, the student should have had courses in the following subjects: chemistry, bacteriology, physics, economics, zoology, genetics, and mathematics.

Courses for Graduates

(Research and courses in assigned problems may be taken on Saturday mornings.)

101. Economic Milk Production.—Twice a week; both semesters. *One-half to two units.*

105. Dairy Manufactures.—Both semesters. *One-half to two units.* Professor Ruehe, Associate Professor Tracy.

106. Dairy Bacteriology.—Research on assigned problems. Both semesters. *One-half to two units.* Professor Prucha.

107. Dairy Chemistry.—Assigned problems. Both semesters. *One-half to two units.* Associate Professor Overman.

108. Physiology of Lactation.—Both semesters. *One-half to two units.* Professor Gaines.

112. Research.—Graduate students writing theses should so indicate in registering in Dairy Husbandry 112. Both semesters. *One to four units.* Special problems along the following lines:

(a) Dairy Bacteriology.—Professor Prucha.

(b) Dairy Chemistry.—Associate Professor Overman.

(c) Dairy Cattle Breeding.—Professor Yapp.

(d) Dairy Cattle Feeding.—Professor Nevens.

(e) Milk Production.—Professor Gaines.

(f) Dairy Manufactures.—Professor Ruehe, Associate Professor Tracy.

113. Seminar.—Current literature in dairy bacteriology, dairy chemistry and dairy manufactures. Once a week; both semesters. *One-half unit.* Members of the Graduate Staff.

114. Seminar.—Current literature relating to various phases of milk production. Once a week; both semesters. *One-half unit.* Professors Gaines, Yapp, Nevens.

Courses for Graduates and Advanced Undergraduates

4. Ice Cream Making.—Five times a week; first semester. Associate Professor Tracy.

5. Composition of Dairy Products.—Three times a week; second semester. Associate Professor Overman.

7. Creamery Buttermaking and Factory Management.—Five times a week; second semester. Professor Ruehe, Mr. Tuckey.

8. Fluid Milk Plant Operations.—Three times a week; second semester. Associate Professor Tracy.

10. Advanced Dairy Bacteriology.—Three times a week; first semester. Professor Prucha, Assistant Professor Brannon.

14. Milk Condensing.—Three times a week; second semester. Associate Professor Tracy.

17. Advanced Study of Dairy Breeds.—Three times a week; first semester. Professor Yapp.

20. Economic Problems in Dairy Farming.—Three times a week; first semester. (Not given in 1937-38.)

21. Systems of Dairy Farming.—Three times a week; second semester.

25. Advanced Dairy Cattle Feeding.—Twice a week; first semester. Professor Nevens.

ECONOMICS

Every student entering on major graduate work in economics must have had a course in the principles of the science and also in some special part of the field such as public finance or money and banking. The work must represent at least eight semester hours. He must have had at least one semester's work in English, American, or general European history, and at least three hours in political science.

Those who take the subject as a minor must have had a course of at least five semester hours in the principles alone, or in the principles and some other course for which this is a prerequisite.

Graduate students who are making economics their major are required during their first year to acquaint themselves with the works of the masters in the science, by taking either course 101 or 103. In the same or subsequent year they are expected to elect the fundamental courses in some other divisions of the field of economics. One of the minors for the doctor's degree may be taken in a separate division of economics; the other must be taken out of the department, and preferably outside of the College of Commerce.

The following courses may be taken by students in general economics for major or minor credit; all numbered above 100; 4, 10, 11, 24, 25, 29, 30, 31, 41, 42, 43, 44, 51, 52, 55, 61, 65, 71, 72, 81, 89, 92, 99. The following may be taken for minor credit only: 8, 9, 31, 36, 56, 82, 83, 93, 96.

Two units will be accepted for a first minor for the master's degree; and four two- or three-hour graduate courses, or their equivalent in advanced undergraduate courses, for a first minor for the doctor's degree.

Courses in agricultural economics, accountancy, and business organization and operation may be used to satisfy the requirements for the minor. See Business Organization and Operation, and Agricultural Economics.

Courses for Graduates

101. Economic Theory.—Planned primarily for first-year graduate students and particularly for those who have had only the minimum preparation required for graduate study in economics. Twice a week; both semesters. *One unit.* Dean Thompson.

102. Monetary Theory and History from the Restriction Period to the Present.—Twice a week; both semesters. *One unit.* Dr. Lounsbury.

103. The Distribution of Wealth.—Theories of value, rent, wages, interest, and profits, and the relations between wealth and welfare. Twice a week; both semesters. *One unit.*

104a. Theories and Policies of International Trade.—Twice a week; first semester. *One unit.* Professor Litman.

104b. Organization of International Trade.—Twice a week; second semester. *One unit.* Professor Litman.

105. Public Finance.—Twice a week; both semesters. *One unit.* Professor Hunter.

106. International Exchange and the Money Markets.—Twice a week; second semester. *One unit.* (Not given in 1937-38.)

107. The Corporation in Economic Evolution.—Twice a week; both semesters. *One unit.* (Not given in 1937-38.) Assistant Professor Brown.

109. Comparison of the Theory and Practice of the Leading Central and Reserve Banks with Special Reference to England, Germany, France, and the United States.—Twice a week; first semester. *One unit.* (Not given in 1937-38.)

110. Corporation Finance and Investments.—Twice a week; both semesters. *One unit.* Assistant Professor Brown.

112. Labor Problems.—Twice a week; both semesters. *One unit.*

118. Seminar.—Thesis course. (All graduate students writing theses in economics must register in Economics 118; registration for other students is optional.)
(a) Third Year: Seminar.—Professor Litman.
(b) First Year: General Economics.—Assistant Professor Brown.
(d) First Year: Public Utilities.—Associate Professor Gray.

120. History of Economic Thought.—Twice a week; both semesters. *One unit.*

122. Economic History of the United States.—Twice a week; both semesters. *One unit.* Professor Bogart.

123. Industrial and Financial Organization of Society.—Twice a week; both semesters. *One unit.* Professor Lee.

124. International Economics and Finance.—Twice a week; both semesters. *One unit.* (Not given in 1937-38.)

140. Capitalism, Socialism, Fascism, and Communism.—Twice a week; second semester. *One unit.* Dr. Helbing.

143. The Administration of Industrial Relations.—Twice a week; first semester. *One unit.* Dr. Helbing.

144. Economic Statistics with Special Reference to Time Series and Business Cycles.—Twice a week; both semesters. *One unit.* Assistant Professor Dickinson.

180. Management of Public Utilities.—Twice a week; both semesters. *One unit.* Associate Professor Gray.

192. Economics of Transportation.—Twice a week; both semesters. *One unit.* Associate Professor Locklin.

See also Mathematics 129.—Theory of Statistics.

Courses for Graduates and Advanced Undergraduates

4. History of Money, Credit, and Banking Institutions, with Particular Reference to the United States.—Three times a week; second semester. (Not given in 1937-38.)

8. Foreign Exchange and the Money Market.—Three times a week; second semester.

9. Advanced Theory and Practice of Banking.—Three times a week; first semester. Professor Lee.

10. Corporation Finance and Management.—Three times a week; either semester. Associate Professor Gray and others.

11. Industrial Consolidation. — Development; plans for controlling trusts. Three times a week; first semester. Assistant Professor Brown.

19. Economic Development of the United States (1820-1860).—Twice a week; first semester. Dean Thompson.

20. Economic Development of the United States since 1860.—Twice a week; second semester. Dean Thompson.

23. Economic Problems.—Three times a week; first semester. Professor Lee.

24. Economic Development of Modern Europe.—Three times a week; second semester. Professor Bogart.

25. Economic History of England.—Three times a week; first semester. Professor Bogart.

29. International Commerce and Commercial Policies.—Three times a week; second semester. Professor Litman.

30. World Markets.—Three times a week; second semester. Professor Litman.

31. Organization of International Commerce.—Three times a week; first semester. Professor Litman.

36. Investments.—Three times a week; second semester. Assistant Professor Brown.

41. Labor Problems.—Three times a week; first semester.

42. Trade Unionism.—Three times a week; second semester.

43. Personnel Administration.—Three times a week; second semester. Dr. Helbing.

44. Socialism and Economic Reform.—Three times a week; either semester. Dr. Helbing.

51. Public Finance.—Three times a week; either semester. Professor Hunter.

52. Problems in Taxation, with Special Reference to Illinois.—Three times a week; second semester. Professor Hunter.

55. Economics of Insurance (Life).—Three times a week; first semester. Assistant Professor Dickinson.

56. Economics of Insurance (Property).—Three times a week; second semester. Assistant Professor Dickinson.

58. Urban Land Economics.—Three times a week; first semester. (Not given in 1937-38.) Assistant Professor Dickinson.

61. Economic Theory.—Three times a week; both semesters.

71. Economic Statistics.—Three times a week; first semester. Assistant Professor Dickinson.

72. Economic Statistics (Business Barometers).—Three times a week; second semester. Assistant Professor Dickinson.

81. Principles of Public Utilities.—Three times a week; first semester. Associate Professor Gray.

82. Regulation of Public Utilities.—Twice a week; second semester. Associate Professor Dillavou.

83. Public Utility Rates.—Three times a week; second semester. Associate Professor Gray.

93. Industrial Traffic Management.—Three times a week; second semester. Associate Professor Locklin.

94. Ocean Shipping.—Three times a week; first semester. Associate Professor Locklin.

95. Railroad Rates.—Three times a week; first semester. Associate Professor Locklin.

96. Transportation Problems.—Three times a week; second semester. Associate Professor Locklin.
97. Railroad Finance.—Three times a week; second semester. Associate Professor Locklin.
98. Railroad Organization.—Twice a week; first semester. (Not given in 1937-38.) Associate Professor Locklin.

EDUCATION

In addition to complying with the general rules of the Graduate School, candidates for the master's degree in education must meet the following requirements: (1) Education 125 is a required course for all students; (2) for students who have not taken a course in the history of education, Education 11 or Education 30 is required; (3) Education 6 and 25, or their equivalents, are prerequisites for all graduate courses.

No student is recommended to the Dean of the Graduate School for formal admission to candidacy for the master's degree until at least four units of the eight ordinarily required for the degree have been completed satisfactorily. In the case of a student who has been allowed to waive the thesis (see page 13) two papers will be required. The first shall be written during the first half of the student's residence and shall be an important factor in determining his further status in the department. The second shall be written during the second half of the student's period of residence.

Courses for Graduates

101. Philosophy of Education.—Once a week; two hours; second semester. *One unit.* Professor Cameron.
102. Research in History of American Education.—Arrange; both semesters. *One unit.* Professor Seybolt.
104. Educational Administration.—Once a week; two hours; both semesters. *One unit.* Associate Professor Weber.
106. Organization and Administration of Secondary Education.—Once a week; two hours; first semester. *One unit.* Professor Clement.
110. Recent Research in the Teaching of High School Subjects.—Once a week; two hours; both semesters. *One unit.* Professor Monroe.
119. Trends and Techniques in Curriculum Making.—Once a week; two hours; both semesters. *One unit.*
120a. Seminar in the Supervision of Secondary Education.—Once a week; two hours; second semester. *One unit.* Professor Clement.
121. Educational Measurements.—Once a week; two hours; second semester. *One unit.* Associate Professor Odell.
123. Educational Statistics.—Once a week; two hours; first semester. *One unit.* Associate Professor Odell.
124. Techniques in Educational Research.—Once a week; two hours; both semesters. *One unit.* Professor Monroe.
125. Advanced Educational Psychology.—Once a week; two hours; first semester. *One unit.* Professor Cameron.
127. High School Curricula.—Once a week; two hours; first semester. *One unit.* Professor Clement.
128. Junior High School.—Once a week; two hours; first semester. *One unit.* Professor Clement.
129. The Junior College.—Once a week; two hours; second semester. *One unit.* Professor Clement.

131. Study of Textbooks and Other Materials of Instruction in Secondary Schools.—Once a week; two hours; second semester. *One unit.* Professor Clement.

132. Diagnostic and Remedial Work in Arithmetic.—Once a week; first semester. *One unit.* Professor Spencer.

133. Problems of Instruction and Supervision in Secondary Education.—For interns only. Once a week; both semesters. *One unit.* Professor Clement, Assistant Professor Sanford.

134. The Teaching and Supervision of Reading and the Language Arts in the Elementary School.—Once a week; first semester. *One unit.* Professor Reeder.

135. The Teaching and Supervision of the Social Studies in the Elementary School.—Once a week; first semester. *One unit.* Professor Reeder.

139. Seminar in Curriculum Problems.—Once a week; two hours; both semesters. *One unit.*

147. Psychology of the Elementary School Subjects.—Once a week; two hours; first semester. *One unit.* Professor Cameron.

148. Psychology of the Secondary School Subjects.—Once a week; two hours; second semester. *One unit.* Professor Cameron.

150. Thesis.—Both semesters. *One or two units.* Dean Benner and others.

170. Public School Finance and Business Administration.—Once a week; two hours; first semester. *One unit.* Associate Professor Weber.

184. Seminar in School Administration.—Once a week; two hours; second semester. *One unit.* Associate Professor Weber.

185. Seminar in Educational Psychology.—Arrange; both semesters. *One unit.* Professors Cameron, Griffith.

186. Seminar in Secondary Education.—Once a week; two hours; both semesters. *One-half unit.* Professor Clement.

187. Seminar in Industrial Education.—Once a week; two hours; first semester. *One unit.* Professor Mays.

190. Research in Education.—Arrange; both semesters. *One unit.* Dean Benner and others.

Courses for Graduates and Advanced Undergraduates

11. Ancient and Medieval Education.—Twice a week; first semester. Professor Seybolt.

15. Mental Hygiene in the School.—Three times a week; second semester. Professor Griffith.

18. Educational Measurements.—Three times a week; both semesters. Associate Professor Odell.

21. Supervision of Elementary Education.—Three times a week; first semester. Assistant Professor Browne.

30. History of American Education.—Twice a week; second semester. Professor Seybolt.

31. Introduction to Modern Theories in Education.—Three times a week; second semester. Assistant Professor Browne.

41. Principles of Vocational Education.—Three times a week; second semester. Professor Mays.

42. Special Education (Superior and Handicapped Children).—Once a week; second semester. Assistant Professor Dolch.

43. Mental Tests.—Three times a week; second semester. Assistant Professor Potthoff.

45. Genetic Psychology for Teachers.—Three times a week; first semester. Professor Griffith.

46. Recent Developments in the Teaching of Elementary School Subjects.—Once a week; first semester. Assistant Professor Dolch.

52. Part-Time and Evening Schools.—Three times a week; first semester. Professor Mays.

53. Problems of Industrial Education.—Three times a week; first semester. Professor Mays.

55. Problems of Vocational Guidance.—Three times a week; second semester. Professor Mays.

ELECTRICAL ENGINEERING

The prerequisite for graduate work in electrical engineering is the equivalent of the undergraduate courses required for the degree of Bachelor of Science in electrical engineering in the branches of the subject in which registration is desired. Graduate students who wish to take a minor in electrical engineering must have had differential and integral calculus, and one year's work in college physics. Courses offered to junior and senior students in electrical engineering are open for minor credit to students majoring in other departments who have the proper prerequisites.

Courses for Graduates

101. Advanced Courses in Alternating Currents.—Both semesters. *One-half to two units:*
   (a) Graduate Seminar.—Professor Paine.
   (b) Circuit Transients.—Professor Knight.
   (c) Machine Transients.—Assistant Professor Keener.
   (d) Symmetrical Components.—Assistant Professor Kraehenbuehl.

102. Electric Waves, Oscillations, and Transients.—Both semesters. *One-half to two units:*
   (a) Theory of Electric Waves, Oscillations, and Transients.—Associate Professor Reich.
   (b) Demonstration Lectures.—Associate Professor Reich.
   (c) Theory of Energy Radiation.—Assistant Professor Brown.
   (d) Principles of Television Engineering.—Assistant Professor Brown.

103. Electrical Design.—Both semesters. *One to three units:*
   (a) Power Plant Design.—Professor Paine.
   (b) Machine Design.—Professor Paine.
   (c) Illumination Practice and Design.—Assistant Professor Kraehenbuehl.

104. Vacuum Tubes and Electronic Control.—Both semesters. *One unit:*
   (a) Theoretical Electronics.—Associate Professor Reich.
   (b) Vacuum Tubes and Amplifiers.—Associate Professor Reich.
   (c) Photoelectric Cells, Gaseous Control Tubes, and Inverters.—Associate Professor Reich.

105. Electrical Engineering Research.—Both semesters. *One to three units.* Professors Paine, Tykociner, Knight; Associate Professor Reich; Assistant Professors Brown, Keener, Kraehenbuehl.

ENGLISH LANGUAGE AND LITERATURE

Students who enter on graduate work with English as their major subject are required to give evidence of their ability to write good English. They must present the equivalent of fourteen hours of undergraduate work in English literature, the required college work in rhetoric, and the equivalent of four semesters of college work in Latin, or in Greek, or in French, or in German. After the first year of graduate work a knowledge of French and German is indispensable.

Students making English their minor may be admitted to such courses as in the judgment of the instructor in charge they are qualified to pursue.

The Degree of Master of Arts in English.—In addition to complying with the general rules of the Graduate School, candidates for the degree of Master of Arts in English must comply with the following rules of the Department of English: (1) They must choose most of their work from the group of courses described as "for graduates"; (2) must offer an elementary course in Anglo-Saxon; and (3) must pass a general examination.

The Degree of Doctor of Philosophy in English.—Candidates for the degree of Doctor of Philosophy in English may expect to be examined on the entire field of the English language and literature. They are urged, furthermore, to acquaint themselves as fully as possible with the history and philosophy of the period in which their main interest lies, and with the foreign languages and literature most closely related to English and that period.

Courses for Graduates

101. Research in Special Topics.—*One to two units.* Professors Bernbaum, Flom, Paul, Zeitlin, T. W. Baldwin, Graham, E. C. Baldwin, Jones, Hillebrand, Jefferson; Associate Professors Parry, Fletcher, Parrish, Secord, Landis; Assistant Professors Rinaker, Finney.

110. Old English (Anglo-Saxon) Poetry.—Twice a week; first semester. *One unit.* Professor Flom.

111. Caedmon and Cynewulf.—Twice a week; first semester. *One unit.* (Not given in 1937-38.) Professor Jones.

114. Development of the Essay.—The English essay; classical origins; continental influences. Twice a week; both semesters. *One unit.* (Not given in 1937-38.) Professor Zeitlin.

121. History of Rhetorical Theory.—Twice a week; both semesters. (Not given in 1937-38.) Professor Parrish.

128. Literature of the Sixteenth Century.—Twice a week; both semesters. *One unit.* Professor Jones.

129. English Literature from the Norman Conquest to 1400.—Twice a week; both semesters. *One unit.* (Not given in 1937-38.) Professor Jones.

130. Tragedy.—Twice a week; both semesters. *One unit.* Professor Hillebrand.

135. Problems in American Literature.—Twice a week; both semesters. *One unit.* Professor Paul.

137. Prose Writers of the Nineteenth Century.—Twice a week; both semesters. *One unit.* Professor Zeitlin.

138. The Romantic Movement.—Twice a week; first semester. *One unit.* Professor Bernbaum.

140. Investigations in Modern English Literature.—(For second-year and third-year graduate students who are preparing theses for the doctor's degree.) Once a week; three hours; first semester. *One to three units.* (May be taken in successive years.) Professor Bernbaum.

141. Literature of the Seventeenth Century.—Twice a week; both semesters. *One unit.* Professor E. C. Baldwin.

143. Seminar in the History and Theory of Prose Fiction.—Once a week; two hours; first semester. *One unit.* Professor Bernbaum.

145. Studies in Eighteenth Century Literature.—Once a week; two hours; second semester. *One unit.* Professor Graham.

146. The Text of Milton.—Once a week; two hours; both semesters. *One unit.* Associate Professor Fletcher.

147. Shakespeare and Elizabethan Drama.—Critical study of the chief plays. Twice a week; both semesters. *One unit.* Professor T. W. Baldwin.

148. Seminar in Elizabethan Drama.—Twice a week; second semester. *One unit.* (Not given in 1937-38.) Professor T. W. Baldwin.

149. Development of Tudor Drama.—Twice a week; both semesters. *One unit.* Professor T. W. Baldwin.

153. Seminar in Restoration Drama.—Once a week; two hours; first semester. *One unit.* (Not given in 1937-38.) Professor Hillebrand.

157. Seminar in Spenser.—Twice a week; first semester. *One unit.* Professor Jones.

Courses for Graduates and Advanced Undergraduates

3. Poetry of Milton.—Three times a week; second semester. Professor E. C. Baldwin.

8. Old English (Anglo-Saxon).—Three times a week; first semester. Professor Flom.

9. Old English (Anglo-Saxon).—Beowulf. Three times a week; second semester. Professor Jones.

17. History of the English Language.—Three times a week; second semester. Professor Flom.

25. Chaucer.—Three times a week; first semester. Professor Jones.

26. Spenser.—Three times a week; second semester. Professor Jones.

34. Dr. Johnson and His Circle.—Three times a week; first semester. Assistant Professor Rinaker.

35. The English Drama (Previous to Shakespeare).—Three times a week; first semester. Professor T. W. Baldwin.

36. The English Drama (Exclusive of Shakespeare) from 1600 to 1700.—Three times a week; second semester. Professor Hillebrand.

38. Development of Arthurian Romance.—Three times a week; second semester. Associate Professor Parry.

54a–54b. Introduction to Comparative Literature.—Three times a week; both semesters. Professors Aron, Carnahan, Canter, Van Horne; Associate Professors Perry, Parry, Hamilton, Landis; Dr. Busey.

55a–55b. Survey of English Literature.—Three times a week; both semesters. Associate Professor Parry, Assistant Professor Finney.

SCANDINAVIAN LANGUAGES

Preparation for major graduate work in the Scandinavian languages or literature must include a good knowledge of one of the Scandinavian languages and systematic work in the undergraduate courses in Scandinavian. Any graduate student in language may, however, be admitted to course 101.

Courses for Graduates

101. Old Norse.—Introduction to the language; grammar; reading of the Prose Edda in part, and selections from the sagas. Twice a week; both semesters. *One unit.* Professor Flom.

102. Old Danish.—Introduction to the language; study of texts. Twice a week; first semester. *One unit.* (Not given in 1937-38.) Professor Flom.

103. Old Swedish.—Introduction to the language; study of texts. Twice a week; second semester. *One unit.* Professor Flom.

110. Old Norse Poetry. (Advanced Old Norse).—Critical study of the *Poetic Edda.* Twice a week; either semester. *One unit.* Professor Flom.

130. The Runic Inscriptions: Old Scandinavian, Anglo-Saxon, Gothic, and German.—Twice a week; second semester. *One unit.* (Not given in 1937-38.) Professor Flom.

150. Research.—Thesis; special problems in Scandinavian philology and modern Scandinavian literature. Once a week; both semesters. *One-half to two units.* Professor Flom.

ENTOMOLOGY

The prerequisite for graduate work in entomology is two years of undergraduate biology, including zoology and entomology. Entrance on major work in entomology requires at least six hours of entomology. A reading knowledge of French and German is desirable by the beginning of the second year.

Courses for Graduates

100. Research.—Once or twice a week; both semesters. *One-half to four units.*
- (a) Morphology and Embryology of Insects.—Associate Professor Hayes.
- (b) Economic Entomology.—Professor Metcalf.
- (c) Systematic Entomology.—Professor Metcalf, Assistant Professor Balduf.
- (d) Biology and Ecology of Insects.—Professor Metcalf.

107. Insect Anatomy.—Lectures and laboratory. Three times a week; both semesters. *One unit.* (Given in alternate years; not given in 1937-38.) Associate Professor Hayes.

Courses for Graduates and Advanced Undergraduates

6. Special Problems.—Once or twice a week; both semesters. Various instructors.

8c. Pests of Man and Domestic Animals.—Lectures and laboratory. Three times a week; second semester. (Given in 1937-38 and in alternate years.) Professor Metcalf.

10. Morphology and Taxonomy of Immature Insects.—Lectures and laboratory. Three times a week; both semesters. (Given in 1937-38 and in alternate years.) Associate Professor Hayes.

20. Insect Control.—Lectures and laboratory. Three times a week; first semester. Professor Metcalf.

21. Insect Bionomics.—Lectures and readings. Three times a week; second semester. (Given in alternate years; not given in 1937-38.) Professor Metcalf.

GENETICS

Those desiring a general training in genetics may take a major or minor in botany or zoology. Those desiring to approach agricultural problems through genetics may take a major or minor in agronomy, horticulture, or animal husbandry. For courses in the subject see departments of Agronomy, Animal Husbandry, Botany, Horticulture, and Zoology.

GEOLOGY AND GEOGRAPHY

For graduate work in geology the student must usually have had at least a major in geology and an acceptable field training. The following undergraduate courses are recommended: Geology 2, 20, 9, 16, 15, 24, and 49. Graduate students in other departments may nevertheless be admitted to certain graduate courses in geology.

For graduate work in geography the student must have had at least the equivalent of a major in geography.

GEOLOGY

Courses for Graduates

101. Advanced Crystallography.—The forms and physical properties of crystallized bodies. Optical properties. Projections and measurements in preparation for x-ray, chemical, ceramic, and geological research. Twice a week; both semesters. *One unit.* Professor Quirke.

102. Igneous Petrography.—Lectures; laboratory. Twice a week; both semesters. *One unit.* Professor Quirke.

122. Mountain and Continental Structures.—A study of the structure and dynamics of mountain ranges and of other areas having interesting structural problems. Three times a week; first semester. *One unit.* (Not given in 1937-38.) Associate Professor Shepard.

125. Sedimentation.—The interpretation of sedimentary rocks in terms of their origin. Three times a week; first semester. *One unit.* (Given in alternate years; not given in 1937-38.) Assistant Professor Wanless.

126. Sedimentary Petrology.—Description of sedimentary rocks and cuttings; various methods of analysis of sedimentary rocks and interpretation of results. Two or three times a week; second semester. *One unit.* (Given in 1937-38 and in alternate years.) Assistant Professor Wanless.

134. Advanced Studies in Geology.—Studies in petrography, crystallography, metamorphism, pre-Cambrian geology, ore deposition, advanced paleontology, micropaleontology, geophysical prospecting, and other subjects, to be arranged with members of the department. *One-half to four units.*

135. Research.—Once a week; both semesters. *One-half to four units.* Members of the department.

142. Stratigraphic Paleontology: Paleozoic.—The invertebrate index fossils of the successive geologic formations. Three times a week; first semester. *One unit.* Assistant Professor Sutton.

143. Stratigraphic Paleontology: Mesozoic and Cenozoic.—Stratigraphic study of the formations with a consideration of characteristic fossils. Three times a week; second semester. *One unit.* Assistant Professor Sutton.

151. Advanced Dynamic Geology.—A critical analysis of geologic processes and their results; the materials and structure of the earth; problems of geologic interpretations. Three times a week; first semester. *One unit.* (Given in alternate years; not given in 1937-38.) Associate Professor Shepard.

152. Advanced Historical Geology.—Cosmogeny; the record of diastrophism; the development of the continents and oceans; the relationship between oceanic fluctuations and organic differentiation and evolution; physiographic, climatic, and organic history. Three times a week; first semester. *One unit.* (Given in 1937-38 and in alternate years.) Assistant Professor Sutton.

160. Petroleum Geology.—Three times a week; both semesters. *One unit.* (Given in alternate years; not given in 1937-38.) Professor De Wolf.

Courses for Graduates and Advanced Undergraduates

9. Invertebrate Paleontology.—Fossil groups in biological sequence. Three times a week; first semester. Assistant Professor Sutton.

15. Structural Geology.—Rock deformation and its results. Three times a week; first semester. (Given in 1937-38 and in alternate years.)

16. Stratigraphy.—Fossil faunas, with special reference to Paleozoic invertebrates, correlation, and stratigraphy. Three times a week; second semester. Assistant Professor Sutton.

24. Field Methods and Mapping.—Once a week and three or four one-day field trips and one longer field trip; second semester. (Given in 1937-38 and in alternate years.) Assistant Professor Wanless.

49. Microscopic Mineralogy.—Five times a week; second semester. Professor Quirke.

60a–60b. Introduction to Research.—Two or four times a week; both semesters. Members of the department.

61a-61b. Applied Petroleum Geology.—Primarily for students in the College of Engineering. Three times a week; both semesters. Professor De Wolf.

95. Economic Geology.—The nature, occurrence, origin, and uses of coal, oil, building stones, and bedded deposits of economic importance. Three times a week; first semester. (Given in 1937-38 and in alternate years.) Professor De Wolf.

96. Economic Geology.—The nature, occurrence, and origin of metalliferous deposits; theories of ore deposition. Three times a week; second semester. (Given in 1937-38 and in alternate years.) Professor Quirke.

GEOGRAPHY

Courses for Graduates

134. Advanced Studies in Geography.—Studies in geographical subjects. *One-half to four units.* Professor Blanchard, Assistant Professor Page.

135. Research.—Once a week; both semesters. *One-half to four units.* Professor Blanchard, Assistant Professor Page.

Courses for Graduates and Advanced Undergraduates

8. Geography of Europe.—Three times a week; first semester. Professor Blanchard.

10. Geography of Africa.—Three times a week; second semester. (Given in alternate years; not given in 1937-38.) Assistant Professor Page.

11. Geography of Asia.—Three times a week; second semester. (Given in 1937-38 and in alternate years.) Dr. Booth.

14a. Climate of the Continents.—Three times a week; second semester. (Given in alternate years; not given in 1937-38.) Assistant Professor Page.

53. Production of the Great World Staples.—Three times a week; second semester. (Given in 1937-38 and in alternate years.) Professor Blanchard.

54. Advanced Commercial Geography.—Three times a week; second semester. (Given in alternate years; not given in 1937-38.) Professor Blanchard.

60a–60b. Introduction to Research.—Two or four times a week; both semesters. Members of the department.

GERMAN

Students desiring to take German as a major are required to have finished successfully a four-year course of undergraduate work in German, or its equivalent. They are also required to be familiar with the principal works of the writers of the classical and modern periods of German literature, to show a general knowledge of the history of German literature, and to be able to follow lectures in the German language.

Of collateral subjects, a reading knowledge of French is important and is required for advanced graduate work. Some acquaintance with Latin and with German history is highly desirable.

Courses for Graduates

101. Seminar in the German Novel.—Twice a week; both semesters. *One unit.* Professor Aron.

Note.—Course 101 is arranged in a three-year rotation: Seminar in Goethe and Schiller, 1938-39; Seminar in Modern German Drama, 1939-40. Course S101 is arranged in a two-year rotation: Seminar in Volkskunde with Special Reference to the Volkslied, Summer of 1937, Professor Williams; Seminar in the German Lyric, Summer of 1938, Professor Aron.

102. Thesis.—Both semesters. *One-half to two units.* Professors Aron, Williams; Assistant Professor Geissendoerfer; Dr. Jehle.

104. Gothic.—Grammar and literature. Twice a week; first semester. *One unit.* Professor Williams.

105. Old High German.—Grammar and interpretation of the oldest literary documents. Twice a week; second semester. *One unit.* Professor Williams.

110. Early German Drama.—German drama up to the Reformation. Twice a week; second semester. *One unit.* (Alternates with course 32.)

113. German Literature of the Fifteenth and Sixteenth Centuries.—Twice a week; first semester. *One unit.*

117. German Literature of the Seventeenth and Eighteenth Centuries.—Twice a week; both semesters. *One unit.* (Given in alternate years; not given in 1937-38.) Professor Aron.

121. Walther von der Vogelweide.—Twice a week; second semester. *One unit.* (Alternates with course 121a.) Professor Williams.

121a. The Nibelungenlied.—Twice a week; second semester. *One unit.* (Alternates with course 121; not given in 1937-38.) Professor Williams.

Courses for Graduates and Advanced Undergraduates

19a–19b. Goethe's Faust.—The Faust legend and early Faust books and plays; the genesis of Goethe's *Faust;* reading of both parts. Twice a week; both semesters.

26a. German Literature to 1800.—Three times a week; first semester. Professor Aron.

26b. German Literature since 1800.—Three times a week; second semester. Professor Aron.

31. Middle High German.—Twice a week; first semester. Professor Williams.

32. History of German Civilization.—Three times a week; second semester. (Alternates with course 110; not given in 1937-38.)

HISTORY

Graduate work in history requires two years of college work in this subject, or sixteen semester hours, which should ordinarily include introductory courses in European and American history. Linguistic preparation is important, especially in French and German. For medieval history some knowledge of Latin is essential and Spanish is useful for certain fields of American history.

Advanced courses in history at the University of Illinois are of three kinds: (1) Courses for information and guidance in general reading. (2) Instruction in methodology, historiography, and bibliography. A part of this work (in course 103) is required of all graduate students in history during their first year. (3) Seminar courses for the study of special fields with a view primarily to training in the methods of historical criticism and research.

Illinois Historical Survey.—Students of history have an opportunity to pursue research in western history in connection with the Illinois Historical Survey, which is an organization for the purpose of carrying on systematic studies in the history of Illinois.

Attention is also called to the fact that the University of Illinois has for some time coöperated with the Trustees of the State Historical Library in the gathering and editing of archive material. As a result of this relation instructors and graduate students in the department have contributed from time to time to the publications of the Library and have been given useful training in the study of manuscript as well as of printed material.

Higher Degrees in History.—The following statement regarding the specific requirements for higher degrees in history is subject to the general requirements of the Graduate School.

Master of Arts

In addition to meeting the usual tests in the specific courses taken, each candidate for this degree will ordinarily be required to pass a general written examination early in the year and toward the close of the second semester an examination, also written, in two of the following fields: ancient history; medieval history of continental Europe; modern history of continental Europe; English history; American history; Latin-American history. The candidates are expected to have a general knowledge of historical method (see course 103). The department further requires a working knowledge of one important foreign language, ordinarily French or German.

Doctor of Philosophy

Major Requirements.—A candidate who selects history as his major subject may offer himself for examination in any four of the fields indicated below, stating also the particular field among these four in which he wishes to specialize and in which his thesis is to be written:

1. Ancient history. 2. Medieval history and institutions of continental Europe, to the close of the thirteenth century. 3. Continental Europe from 1300 to 1648. 4. Continental Europe and its dependencies since 1648 (except as included in 5 and 6). 5. The history of England and its dependencies (not including America before 1783). 6. The history of the United States. 7. The history of Latin America. This enumeration of fields is not to be regarded as excluding the possibility of accepting others as may be determined by the department in individual cases.

MINOR SUBJECTS.—A candidate for the doctorate in history may select as his first minor one of the divisions of the field of history listed above which is not offered as a part of his major. He should preferably, however, select his minors from subjects offered by other departments. The following list of suitable minors is intended to be suggestive rather than exhaustive or compulsory.

Political Science.—(Any two acceptable for a first minor; any one, for a second minor.) 1. International law and diplomacy. 2. Modern government. 3. Municipal government. 4. Constitutional and administrative law and jurisprudence. 5. Political theory.

Economics and Sociology.—(Any two acceptable for a first minor; any one, for a second minor.) 1. Economic history. 2. Economic theory. 3. Public and private finance. 4. Social reform. 5. Principles of sociology.

Philosophy and Education.—(Any two acceptable for a first minor; any one, for a second minor.) 1. History of ancient and medieval philosophy. 2. History of modern philosophy. 3. History of education.

Literature.—Some division of the history of literature which may be either comparative literature of a limited period or the literature of a particular country for a more extended period as may be agreed upon in each case.

Courses for Graduates

101. SEMINAR IN AMERICAN HISTORY.—Once a week; two hours; both semesters. *One unit.* Semester I: Introduction to research in American history. Professor ROBERTSON. Semester II: Guidance in the investigation of selected topics. Professor RANDALL.

102. SEMINAR IN ENGLISH HISTORY.—A study of selected topics in the early modern period. Arrange hours; both semesters. *One unit.* Professor DIETZ.

103. STUDIES IN HISTORICAL METHOD.—Required of all candidates for an advanced degree in history who do not present evidence of similar training elsewhere. Twice a week; first semester. *One unit.* Professor RANDALL.

104. SEMINAR IN MODERN HISTORY.—Once a week; two hours; second semester. *One unit.* Professor LYBYER.

105. RESEARCH IN SPECIAL TOPICS.—Guidance in writing theses for advanced degrees. *One to two units.* Professors LYBYER, ROBERTSON, PEASE, JONES, RANDALL, DIETZ, HANSEN; Associate Professors SWAIN, RODKEY; Assistant Professors DUNBAR, WERNER.

106. SEMINAR IN THE HISTORY OF THE MIDDLE AGES.—Arrange hours; both semesters. *One unit.*

117. SOCIAL HISTORY OF THE UNITED STATES SINCE 1865.—Studies in the social aftermath of the Civil War: agrarian unrest; immigration, urbanization, intellectual interests. Once a week; two hours; both semesters. *One unit.* Professor HANSEN.

122. HISTORY OF THE WEST.—An intensive study of the westward movement, 1748-1778. Twice a week; both semesters. *One unit.* Professor PEASE.

126. SPAIN IN EUROPE AND AMERICA, 1750-1870.—Bibliography, historiography, and topical reports. Arrange hours; first semester. *One unit.* Professor ROBERTSON.

127. INTER-AMERICAN RELATIONS.—Relations of the Latin-American nations with each other and with the United States. The Monroe Doctrine, inter-

vention, etc. Arrange hours; second semester. *One unit.* Professor Robertson.

133. Studies in the History of Europe in the Nineteenth Century.—Once a week; two hours; both semesters. *One unit.* Associate Professor Rodkey.

138. Studies in the History of France in the Sixteenth and Seventeenth Centuries.—Twice a week; both semesters. *One unit.* Professor Jones.

150. Seminar in Ancient History.—Problems in the relations of East and West. Arrange hours; both semesters. *One unit.* Associate Professor Swain.

Courses for Graduates and Advanced Undergraduates

16a–16b. The American Colonies in the Eighteenth Century and the Beginnings of National Life and Organization.—Three times a week; both semesters. Assistant Professor Dunbar.

17a–17b. Social and Economic Forces in the United States in the Nineteenth Century.—Three times a week; both semesters. Professor Hansen.

19a–19b. History of American Immigration.—Twice a week; both semesters. Professor Hansen.

20a–20b. History of the South.—Twice a week; both semesters. Professor Randall.

21. History of the United States since 1877.—Three times a week; second semester. Professor Randall.

22a–22b. History of the West, 1634-1830.—Twice a week; both semesters. Professor Pease.

25. The Civil War and the Reconstruction.—Three times a week; first semester. Professor Randall.

26. History of the Latin-American Colonies.—Three times a week; first semester. Professor Robertson.

27. History of Latin America from the Wars of Independence to the Present Time.—Three times a week; second semester. Professor Robertson.

29. America and Europe, 1776-1870.—Foundations of international intercourse, with particular reference to the Latin-American colonies and states. Three times a week; second semester. Professor Robertson.

32a–32b. History of Europe since 1878.—Three times a week; both semesters. Professor Lybyer.

36a–36b. History of the German People in Modern Times.—Three times a week; both semesters. Associate Professor Rodkey.

38a–38b. Development of the French Monarchy in the Later Middle Ages and in Early Modern Times, 1285-1648.—Three times a week; both semesters. (Not given in 1937-38.) Professor Jones.

39a–39b. The Renaissance and the Protestant and Catholic Reformations.—The transition from medieval to modern ideals. Three times a week; both semesters. Professor Jones.

44a–44b. Constitutional History of England.—Three times a week; both semesters. Professor Dietz.

46a–46b. Social and Economic History of England, 1750-1937.—Three times a week; both semesters. (Not given in 1937-38.) Professor Dietz.

47a–47b. History of England in the Later Middle Ages and in the Early Modern Period, 1399-1603.—Three times a week; both semesters. Professor Dietz.

55. History of the Ancient Greek States.—Three times a week; first semester. (Not given in 1937-38.) Professor Oldfather.

56. History of the Roman Republic.—Three times a week; second semester. Associate Professor Forbes.

57a–57b. Ancient Imperialism, Hellenistic and Roman.—Three times a week; both semesters. Associate Professor Swain.

60. The United States in the World War.—Three times a week; second semester. (Not given in 1937-38.) Professor Randall.

62a–62b. Political and Constitutional Development of the United States.—Three times a week; both semesters. Professor Randall.

HOME ECONOMICS

As preparation for graduate work with a major in foods and nutrition the student must have had at least the equivalent of the foods and nutrition required in the undergraduate curriculum for the general major in home economics and, in addition, 3-5 hours in foods, dietetics, and nutrition; also quantitative chemical analysis.

As preparation for graduate work with a major in general home economics a student must have had the equivalent of the undergraduate curriculum for the general major in home economics, including a course in the principles of economics.

In addition to graduate courses in home economics the student will offer, for a major in foods and nutrition, either Chemistry 50a or 40 and 41, and for the general major, further courses in education, economics, or sociology.

Graduate students who choose home economics as a minor for the degree of Doctor of Philosophy must have had adequate preliminary preparation in foods and nutrition and must include among the courses to be taken for the minor either Home Economics 41 and 103 or 35 and 105, or must have had their equivalent. Of the courses open to advanced undergraduates, selection may be made from courses 20, 33, 35, 39a, 39b, and 41.

Courses for Graduates

101. Home Economics.—Twice a week; both semesters. *One unit.* Members of the department.

102. Research in Nutrition.—Both semesters. *One-half to three units.* Associate Professor Outhouse; Dr. Hathaway.

103. Nutrition Seminar.—Once a week; both semesters. *One-half unit.* Associate Professor Outhouse.

104. Research in Foods.—Both semesters. One-half to three units. Professor Woodruff.

105. Foods Seminar.—Once a week; both semesters. *One-half unit.* Professor Woodruff.

Courses for Graduates and Advanced Undergraduates

20. Physical Growth and Nutrition.—Twice a week; first semester. Associate Professor Outhouse.

28. Organization and Management of the Home.—Twice a week; second semester. Professor Bane.

31. Clothing.—Three times a week; second semester. Assistant Professor Whitlock.

33. Diet in Disease.—Three times a week; second semester. Assistant Professor Barto.

35. Problems in Foods.—Three times a week; both semesters. Professor Woodruff.

39a-39b. Readings in Food and Nutrition.—Once a week; both semesters. Professor Woodruff; Associate Professor Outhouse; Assistant Professor Barto; Dr. Hathaway.

41. Problems in Nutrition.—Three to five times a week; second semester. Associate Professor Outhouse; Dr. Hathaway.

43a–43b. Problems in Textiles and Clothing.—Three times a week; both semesters. Assistant Professors Jacobsen, Whitlock; Miss Eades.

45. Organization and Teaching of Nutrition Classes.—Twice a week; second semester. Assistant Professor Barto.

48. Institution Dietaries and Administration.—Three times a week; second semester. Assistant Professor Smith.

50. Costume Design.—Twice a week; second semester. Miss Eades.

51. Textiles.—Three times a week; second semester. Assistant Professor Jacobsen.

56. The Child and His Development.—Twice a week; second semester. Assistant Professor Walls.

57a-57b. Problems in Home Management.—Three times a week; both semesters. Professor Bane.

62. Food and Nutrition.—Three times a week; first semester. Dr. Hathaway.

HORTICULTURE

Graduate work is offered in the Department of Horticulture leading to the M.S. and Ph.D. degrees. Candidates may specialize for either degree in floriculture, olericulture, or pomology.

Twenty hours of collegiate work in horticulture and allied subjects are required for entrance upon major work, and twelve hours for minor work. The Department will waive certain of these requirements for some lines of major study if the student has had an equivalent preparation in the fundamental sciences. It is desirable when the major field of study is decided upon during the junior or senior year, to select the fundamental science courses accordingly, and if possible, to include in the undergraduate preparation the elementary courses in German or French.

Advanced work in botany, chemistry, entomology, agronomy, or agricultural economics may advantageously be taken with horticulture to make a well-balanced course of graduate study.

Courses for Graduates

103. Olericulture.—Once a week; both semesters. *One to two units.* Professor Lloyd.

105. Marketing Fruits and Vegetables.—See Agricultural Economics 135.

106. Olericulture Seminar.—Once a week; first semester. *One-fourth unit.* Professor Lloyd.

108. Pomology.—Three times a week; both semesters. *One to four units.*
(a) Pomological Problems.—Professor Blair.
(b) Pomology and Fruit Breeding.—Professor Dorsey.
(c) Pomological Physiology.—Professor Ruth.
(d) Small Fruits.—Professor Colby.
(e) Pomological Pathology.—Professor Anderson.

115. Floriculture.—Once a week; both semesters. *One to two units.*
(a) Floricultural Problems.—Professor Dorner.
(b) Floricultural Physiology and Pathology.—Associate Professor Weinard.

120. Pomology Seminar.—Once a week; both semesters. *One-fourth unit.* Professors Dorsey, Ruth, Anderson.

125. Fruit Development.—Three times a week; first semester. *One unit.* Professor Dorsey.

130. Physiology of Fruit Production.—Three times a week; first semester. *One unit.* Professor Ruth.

135. Fruit and Vegetable Disease Research.—Three times a week; first semester. *One unit.* Professor Anderson.

140. Advanced Small Fruit Culture.—Three times a week; second semester. *One unit.* Professor Colby.

Courses for Graduates and Advanced Undergraduates

12. Evolution of Horticultural Plants.—History, classification, and distribution of cultivated plants; modification under culture; variation; methods. Three times a week; first semester. Professor Dorsey.

43. Greenhouse Fertilizers.—Three times a week; first semester. Associate Professor Weinard.

44. Current Pomological Literature.—For seniors and graduates specializing in pomology. Once a week; both semesters. Professor Ruth.

45. Plant Nutrition.—Three times a week; second semester. Associate Professor Weinard.

46. Marketing Horticultural Products.—See Agricultural Economics 36.

47. Pomological Physiology.—The effects of environment upon fruits. The storage of fruits. Three times a week; first semester. Professor Ruth.

51. Fruit Diseases.—Three times a week; second semester. Professor Anderson.

LIBRARY SCIENCE

Before beginning work for the master's degree in library science students must have completed thirty semester hours of work in library science in this institution or the equivalent in an approved institution.

Students desiring to prepare for work in special types of libraries will be expected to include at least one unit of advanced courses in appropriate subjects other than library science. All such changes in the program of the student must be approved by the Director of the Library School.

Graduate students working toward the master's degree with a major in library science must complete the thesis within three years after first registration therein, unless there is approval of a longer period based upon unusual contingencies.

Courses for Graduates

101. Thesis.—*One to two units.* Professor Windsor and others.

102. Seminar.—Both semesters. *One-half to four units.*

(a) Techniques of the Study of Reading Interests.—(Not given in 1937-38.)

(b) College and University Library Administration.—Once a week; two hours; first semester. *One unit.* Professor Windsor.

(c) Publishers.—Once a week; two hours; second semester. *One unit.* Associate Professor Boyd.

(d) Special Libraries.—

(e) Individual Problems.—*One-half to one unit.* Professor Windsor and others.

(f) Critical Analysis of Current Library Techniques.—*One unit.*

103a-103b. Advanced Reference.—Twice a week; both semesters. *Three-quarters unit each semester.* Miss Phelps.

104a. Advanced Classification.—Once a week; two hours; first semester. *One-half unit.* Associate Professor Bond.

104b. Advanced Cataloging.—Once a week; two hours; second semester. *One-half to one unit.* Associate Professor Bond.

Courses for Graduates and Advanced Undergraduates

7. History of Libraries.—Twice a week; second semester. Miss Singleton.

9. History of Books and Printing.—Twice a week; second semester. Professor Windsor.

13a. Government Publications.—Production, distribution, and use as reference material of United States federal publications. Twice a week; first semester. *Three-quarters unit.* Miss Phelps.

24a-24b. Book Selection for Special Groups.—Twice a week; both semesters. First semester, *three-quarters unit;* second semester, *one-half unit.* Assistant Professor Hostetter.

42. Government Publications.—The use as reference material of American, state, and municipal documents, and of publications of foreign governments. Three times a week; second semester. *Three-quarters unit.* Miss Phelps.

44. Bookbuying for the Large Library.—Twice a week; first semester. (Not given in 1937-38.) Miss Garver.

45. Library Buildings and Equipment.—Twice a week; first semester. (Not given in 1937-38.)

46. High School Library Administration.—Three times a week; second semester. Assistant Professor Hostetter.

48. Library Administration.—Special problems. Twice a week; second semester.

49. Children's Literature.—Twice a week; second semester. Assistant Professor Hostetter.

MATHEMATICS

Students entering on graduate study with a major in mathematics must have had twenty hours of undergraduate work in mathematics besides the usual freshman courses in algebra, trigonometry, and analytic geometry, including a one-year course in calculus and one year of more advanced work in one or more of the fields of algebra, analysis, and geometry. They should be able to read German or French.

Candidates for a doctor's degree taking a first minor in mathematics are expected to have completed a course in calculus and are required to take two one-year courses beyond the calculus; candidates for a doctor's degree taking a second minor are required to complete at least one course throughout a year beyond the calculus.

The more technical courses offered by the department are arranged mainly in cycles of two or of three years, so that a properly qualified student will usually have opportunity to take any particular course at some time during the three years of residence required for the doctor's degree.

Courses for Graduates

100. Seminar.—For thesis work, or for special reading with the consent of the instructor. Three times a week; both semesters. *One to two units.* Professors Coble, Carmichael, Emch, Crathorne; Associate Professors Hazlett, Brahana, Trjitzinsky; Dr. Doob. For the master's degree: Assistant Professor Bailey; Dr. Steimley, Dr. Bourgin, Dr. Pepper, Dr. Miles.

101. Functions of Real Variables.—Three times a week; both semesters. *One unit.* (Not given in 1937-38.)

110. Elliptic Functions.—Three times a week; both semesters. *One unit.* (Not given in 1937-38.) Professor Carmichael.

111. Differential Equations and Asymptotic Expansions.—Three times a week; both semesters. *One unit.* (Not given in 1937-38.)

112. Linear Difference Equations.—Three times a week; both semesters. *One unit.* Professor Carmichael.

113. Linear Differential Equations.—Three times a week; both semesters. *One unit.* (Not given in 1937-38.) Professor Carmichael.

114. Partial Differential Equations.—Three times a week; both semesters. *One unit.* (Not given in 1937-38.)

115. Advanced Topics in the Theory of Functions.—Modern aspects of the theory of functions of a real and of a complex variable; almost periodic and quasi-analytic functions; current investigations. Three times a week; both semesters. *One unit.* Associate Professor Trjitzinsky.

116. Topics in Classical Analysis.—The theory of the Riemann integral in n dimensions, transformations of variables, convergence, orthogonal functions with applications to integral equations, differential operators, etc. Three times a week; second semester. *One unit.* Dr. Doob.

124. Theory of Numbers.—Three times a week; both semesters. *One unit.* (Not given in 1937-38.)

126. Theory of Groups.—Three times a week; both semesters. *One unit.* Associate Professor Brahana.

129. Theory of Statistics.—Three times a week; both semesters. *One unit.* Professor Crathorne.

131. Algebraic Geometry.—Three times a week; both semesters. *One unit.* Professor Coble.

135. Differential Geometry.—Three times a week; second semester. *One unit.* (Not given in 1937-38.) Assistant Professor Levy.

169. The Elements of Higher Geometry and Algebra.—Three times a week; both semesters. *One unit.* Professor Coble.

170. Algebra.—Three times a week; both semesters. *One unit.*

171. Analysis.—Three times a week; both semesters. *One unit.* Dr. Doob.

172. Geometry.—Three times a week; both semesters. *One unit.* Professor Emch.

Courses for Graduates and Advanced Undergraduates

16-17. Differential Equations and Advanced Calculus.—Three times a week; both semesters. Assistant Professor Bailey, Dr. Steimley.

21. Theory of Probability.—Three times a week; second semester. Professor Crathorne.

22. Statistics.—May be counted only toward a minor in mathematics. Three times a week; first semester. Professor Crathorne.

30-31. Actuarial Theory.—Three times a week; both semesters. Dr. Bower.

32. History of Mathematics.—Three times a week; second semester. (Not given in 1937-38.)

35. Teachers' Course.—May be counted only toward a minor in mathematics. Three times a week; both semesters. Assistant Professor Bailey.

36. Advanced Aspects of Euclidean Geometry.—Three times a week; second semester. Dr. Moore.

40. Fundamental Concepts of Mathematics.—Three times a week; both semesters. Dr. Pepper.

52. Partial Differential Equations of Mathematical Physics.—Three times a week; both semesters. Dr. Bourgin.

53. Integral and Operational Equations in Mathematical Physics.—Three times a week; both semesters. (Not given in 1937-38.) Dr. Bourgin.

70. Introduction to Higher Algebra.—Three times a week; both semesters. Dr. Miles.

71. Introduction to Higher Analysis.—Three times a week; both semesters. Dr. Martin.

72. Introduction to Higher Geometry.—Three times a week; both semesters. (Not given in 1937-38.)

MECHANICAL ENGINEERING

The prerequisite for graduate work in mechanical engineering is the equivalent of the undergraduate course required for the degree of Bachelor of Science in mechanical engineering in the branches of the subject in which registration is desired. Courses offered to junior and senior students are open for minor credit to students majoring in other departments.

Courses for Graduates

107. Thermodynamics.—Application of thermodynamics to the solution of physical and engineering problems. Twice a week; both semesters. *One unit.* Professor Goff.

108. The Flow of Fluids and Heat Transfer.—The application of dimensional analysis and other rational formulas. Special problems. Twice a week; both semesters. *One unit.* Professor Macintire.

109. Mechanical Engineering Design.—(a) Machine design; (b) power plant design; (c) dynamics of machinery. Twice a week; both semesters. *One unit.* Professors Leutwiler, Ham.

110. Advanced Heating, Ventilating, and Air Conditioning.—Applications of various systems, notable developments, and results of research. Individual problems. Twice a week; both semesters. *One unit.* Professor Severns.

112. Laboratory Investigations.—Special problems in: (a) combustion; (b) steam; (c) gas and oil engineering; (d) heating, ventilation, and air conditioning; (e) refrigeration; (f) flow of fluids; (g) heat transfer; (h) mechanical transmission of power. Three times a week; both semesters. *One and one-half units.* Professors Polson, Kratz, Ham, Macintire, Severns, Goff.

117. Advanced Refrigerating Engineering.—Advanced theory and special cycles. Design of comfort cooling and other special installations. Twice a week; both semesters. *One unit.* Professor Macintire.

MINING AND METALLURGICAL ENGINEERING

MINING ENGINEERING

The prerequisite for graduate work in mining engineering is the equivalent of the undergraduate courses required for the degree of Bachelor of Science in mining in the branches of the subject in which registration is desired.

Courses for Graduates

101. Advanced Mining Practice.—Twice a week; either semester. *One unit.* Professor Callen.

102. Advanced Preparation of Coal and Ores.—Twice a week; either semester. *One unit.* Assistant Professor Mitchell.

104.[1] Mining Reports.—Twice a week; either semester. *One unit.* Professor Callen.

105.[1] Welfare Work and Education among Mine Employees.—Twice a week; either semester. *One unit.* Professor Callen.

106.[1] Advanced Coal, Ore, and Metallurgical Plant Design.—Twice a week; either semester. *One unit.* Assistant Professor Mitchell.

107.[1] Advanced Non-Ferrous Metallurgical Projects.—Twice a week; either semester. *One unit.* Assistant Professor Mitchell.

Courses for Graduates and Advanced Undergraduates

6. Mechanical Engineering of Mines.—Three times a week; second semester. Professor Callen.

8. Mine Administration.—Three times a week; first semester. Mr. Nicholson.

9. Preparation of Coal and Ores.—Three times a week; first semester. Assistant Professor Mitchell.

15. Mine Ventilation.—Twice a week; second semester. Professor Callen.

20. Mine Ventilation Laboratory.—Twice a week; second semester. Professor Callen.

21. Mine Examination and Valuation.—Three times a week; second semester. Mr. Nicholson.

41. Mining Design.—Three times a week; first semester. Professor Callen.

42. Mining Design.—Twice a week; second semester. Assistant Professor Mitchell.

64. Coal and Ore Preparation Laboratory.—Twice a week; second semester. Assistant Professor Mitchell.

[1]Of courses 104 and 105 only one will be given either semester, according to election of students; the same applies to courses 106 and 107.

METALLURGICAL ENGINEERING

For the present no major work is offered in metallurgy, but advanced undergraduate courses are open to graduate students in engineering or chemistry who select metallurgy as a minor. Physical chemistry is a prerequisite for all courses except Metallurgy 1, 2a, 3, 12, and 13.

Courses for Graduates and Advanced Undergraduates

1. Elements of Metallurgy.—Three times a week; first semester. Assistant Professor Wilder.
2a. Principles of Metallurgy.—Three times a week; first semester. Assistant Professor Wilder.
3. Fire Assaying.—Twice a week; first semester. Assistant Professor Mitchell.
4. Physical Metallurgy.—Three times a week; first semester. Assistant Professor Wilder.
5. Ferrous Metallurgy.—Three times a week; second semester. Assistant Professor Wilder.
6. Metallurgical Calculations.—Twice a week; second semester. Assistant Professor Mitchell.
7. Ferrous Metallography.—Three times a week; first semester. Assistant Professor Wilder.
8. Ferrous Metallography Laboratory.—Twice a week; first semester. Assistant Professor Wilder.
9. Non-Ferrous Metallurgy.—Three times a week; first semester. Assistant Professor Mitchell.
10a. Non-Ferrous Metallography.—Three times a week; second semester. Assistant Professor Wilder.
11. Electrometallurgy.—Three times a week; second semester. Assistant Professor Wilder.
12. Metallography.—Three times a week; second semester. Assistant Professor Wilder.
13. Utilization of Fuels.—Three times a week; first semester. Professor Callen.
41. Metallurgical Design.—Three times a week; first semester. Professor Callen.
42. Metallurgical Design.—Twice a week; second semester. Assistant Professor Mitchell.

PHILOSOPHY

Students who enter on graduate work with philosophy as their major subject must have had a general course in the history of philosophy, a course in logic, and a general course in psychology.

Courses for Graduates

103. Ethics.—Twice a week; second semester. *One unit.* Professor Morrow.
105. Seventeenth Century Continental Thought.—Twice a week; first semester. *One unit.* Associate Professor Gotshalk.
106. English and American Idealism.—Twice a week; first semester. *One unit.* Professor Morrow.
108. Plato.—Twice a week; first semester. *One unit.* Professor Tawney.

110. Locke, Berkeley, Hume.—Twice a week; first semester. *One unit.* (Not given in 1937-38.) Professor Morrow.

112. German Idealism (Kant).—Twice a week; second semester. *One unit.* (Not given in 1937-38.) Associate Professor Gotshalk.

118. Platonic Tradition in Mediaeval Thought.—Twice a week; second semester. *One unit.* Professor Tawney.

119. Seminar in Ancient Philosophy.—Twice a week; first semester. *One unit.* Professor McClure.

120. Seminar in Modern Philosophy.—Twice a week; second semester. *One unit.* Professor McClure.

124. Contemporary Problems.—Twice a week; second semester. *One unit.* (Not given in 1937-38.) Associate Professor Gotshalk.

125. Development of Mind, Self, and Value.—Twice a week; second semester. *One unit.* Professor Tawney.

Courses for Advanced Undergraduates and Graduates

3. History of Ancient and Medieval Philosophy.—Three times a week; first semester. Assistant Professor Nicholson.

4. History of Modern Philosophy.—Three times a week; second semester.

8. Philosophy of the Recent Past.—Three times a week; first semester. Assistant Professor Nicholson.

9. Philosophy of Law and of the State.—Three times a week; second semester. Professor Morrow.

10. Philosophy of Science.—Three times a week; first semester. Associate Professor Gotshalk.

11a. Philosophy of Religion (Systematic).—Three times a week; first semester. Professor Tawney.

11b. Philosophy of Religion (Historical).—Three times a week; second semester. Professor Tawney.

12. Philosophy of Art.—Three times a week; first semester. Associate Professor Gotshalk.

16. Metaphysics.—Three times a week; second semester. (Not given in 1937-38.) Associate Professor Gotshalk.

21. Theory of Knowledge.—Three times a week; first semester. Dr. DeLargy.

22. American Philosophy (Royce, James, Santayana, and Dewey).—Three times a week; second semester. Dr. DeLargy.

PHYSICAL EDUCATION

Students may take a graduate study minor in the field of physical education. The prerequisite is twenty semester hours of approved undergraduate credit in the subject. Students who present evidence of satisfactory teaching experience in the field may have this requirement reduced.

The courses listed below are open to both men and women.

Courses for Graduates and Advanced Undergraduates

31. Problems in Physical Education.—Deals particularly with the curriculum. Once a week; first semester. *One unit.* Professor Staley.

32. Problems in School Health.—Deals particularly with health service programs. Once a week; second semester. *One unit.* Associate Professor Stafford.

PHYSICS

A year of calculus and a year of general physics, with laboratory, are prerequisite for all major and minor graduate work in physics. In addition, graduate students majoring in physics must have had one more advanced course in either physics or mathematics and should be able to use references in German.

Courses for Graduates

109. Historical Development of Physics.—One two-hour period a week; second semester. *One unit.* Associate Professor Schulz.

122. Dynamics.—Four times a week; both semesters. *One unit.* Professor Kunz.

123. Dynamical Theory of Sound.—Three times a week; second semester. *One unit.* (Not given in 1937-38.) Professor Watson.

124. Conduction of Electricity through Gases.—Three times a week; first semester. *One unit.* Assistant Professor Mott-Smith.

125. Hydrodynamics. — Especially modern problems in flow and turbulence. Twice a week; first semester. *One-half unit.* (Not given in 1937-38.) Professor Kunz.

126. Theory of Elasticity.—Three times a week; both semesters. *One unit.* (Not given in 1937-38.) Professor Kunz.

127. Relativity.—Twice a week; both semesters. *One-half unit.* Professor Kunz.

128. Problems and Methods in Theoretical Physics.—Three times a week; first semester. *One unit.* (Not given in 1937-38.) Professor Kunz.

129. Mechanical Vibrations.—The general theory, with applications to plates, rotating shafts, gyroscopes, structures, etc. Twice a week; both semesters. *One-half unit.* (Not given in 1937-38.) Professor Kunz.

131. Physical Laboratory Technique.—Both semesters. *One unit.* (Not given in 1937-38.) Associate Professor Kruger.

144. Advanced Electric and Magnetic Measurements.—Both semesters. *One unit.* (Not given in 1937-38.) Associate Professor Williams.

146. Electrodynamics.—Three times a week; both semesters. *One unit.* Assistant Professor Almy.

147. Electric Oscillations.—Twice a week; both semesters. *One-half unit.* (Not given in 1937-38.) Professor Kunz.

160. Thermodynamics.—Three times a week; first semester. *One unit.* (Not given in 1937-38.) Professor Kunz.

163. Statistical Mechanics.—Three times a week; second semester. *One unit.* Assistant Professor Mott-Smith.

170. Light.—Largely physical optics and spectroscopy. Lectures, assigned readings and recitations, with laboratory experiments. Both semesters. *One to two units.* Assistant Professor Almy.

183. Nuclear Structure.—Three times a week; both semesters. *One unit.* Assistant Professor Bartlett.

184. Line Spectra and Atomic Structure.—Three times a week; first semester. *One unit.* Associate Professor Kruger.

185. Band Spectra and Molecular Structure.—Three times a week; second semester. *One unit.* Assistant Professor Almy.

186. Quantum Mechanics.—Three times a week; both semesters. *One unit.*

190. Research.—Both semesters. *One to three units.* Professors in the department.

198. Seminar.—Both semesters. *One to two units.* Professors in the department.

199. Physics Colloquium.—Attendance is expected of all graduate students. Once a week; both semesters. *No credit.* Assistant Professor Mott-Smith.

Courses for Graduates and Advanced Undergraduates

14a-14b. Theoretical Mechanics.—Three times a week; both semesters. Assistant Professor Mott-Smith.

15. Electricity and Magnetism.—Recommended to students in non-technical courses. Two recitations or lectures and one three-hour laboratory exercise weekly; second semester. Associate Professor Williams.

16. Heat.—Introductory course. Three times a week; first semester. Associate Professor Paton.

17. Light.—Recommended to students in non-technical courses. Two lectures and a three-hour laboratory period weekly; first semester. Associate Professor Schulz.

23. Sound.—Three times a week; first semester. Professor Watson.

25. Architectural Acoustics.—Twice a week; second semester. Professor Watson.

30. Introduction to Theoretical Electricity. — For advanced students in physics, chemistry, mathematics, and engineering. Three times a week; first semester. Associate Professor Williams.

44a–44b. Electric and Magnetic Measurements.—Two three-hour periods a week; both semesters. Associate Professor Williams.

46. Advanced Electrical Measurements.—Second semester. Dr. Green.

51. Practical Optics. — Two lectures and a three-hour laboratory period weekly; second semester. (Not given in 1937-38.) Associate Professor Schulz.

60. Heat.—Three times a week; first semester. Associate Professor Paton.

61. Heat Laboratory.—To accompany Physics 60. One three-hour period a week; first semester. Associate Professor Paton.

62. Kinetic Theory of Heat and Radiation.—Three times a week; second semester. Associate Professor Paton.

71a–71b. Light.—For advanced students in physics, chemistry, mathematics or engineering. Twice a week; both semesters. Assistant Professor Almy.

72a–72b. Light Laboratory.—To accompany Physics 71a-71b. Twice a week; both semesters. Assistant Professor Almy.

78. Radioactivity, Nuclear Physics, and X-rays.—Three times a week; second semester. Dr. Shoupp.

80. Atomic Physics.—A lecture and problem course presenting our modern knowledge of the nature and properties of atoms, ions, electrons, protons, positrons, light quanta, photoelectricity, thermoelectric emission, x-rays, radioactivity, and cosmic rays. Three times a week; first semester. Dr. Green.

PHYSIOLOGY

The prerequisites for graduate work in physiology are Physiology 1, 1a, 5, 6, and 7, or equivalents.

Courses for Graduates

101. Journal Club.—Review of literature. Both semesters. *One-fourth unit.* Associate Professor Burge.

102. Research.—Both semesters. *One to two units.* Associate Professor Burge.

103. Special Phases of the Physiology of Respiration, Circulation, Digestion, Metabolism, Excretion, Secretion, Glands of Internal Secretion, Nervous System.—Both semesters. *One-half to one unit.* Associate Professor Burge, Assistant Professor Steggerda.

Course for Graduates and Advanced Undergraduates

6–7. Advanced Mammalian Physiology.—Five times a week; both semesters. Assistant Professor Steggerda.

POLITICAL SCIENCE

Graduate work in political science is conducted in the following special fields: (1) political theory; (2) international law and diplomacy; (3) modern government; (4) constitutional law, administrative law, and jurisprudence; (5) public administration.

To be admitted to take political science as a major subject, the student must have had at least 18 hours of undergraduate work in political science, economics, and history, not less than nine hours of which have been in political science. To take political science as a minor he must have had at least nine hours' work in these fields, including six hours in political science.

If a student making political science his major is taking both of his minors in other departments, one of them must be in history, economics, or sociology.

Several courses given in other departments are so closely related to those in political science that graduate students whose major is political science may be permitted on petition to take such courses as part of their major work. Attention is called to the courses in public law in the College of Law, the courses in public finance in the College of Commerce and Business Administration, the courses in city planning given by the College of Fine and Applied Arts, and the technical courses in municipal and sanitary engineering in the College of Engineering.

Courses for Graduates

101. History of Political Theories.—Three times a week; first semester. *One unit.* Professor Garner.

102. The Nature of the State.—Twice a week; second semester. *One unit.* Professor Fairlie.

103. Seminar in Political Science and Public Law.—Once a week; both semesters. Members of the department.

104. Municipal Administration.—Twice a week; second semester. *One unit.* Associate Professor Kneier.

105. Constitutional Law: Research in Selected Topics.—Twice a week; first semester. *One unit.* (Not given in 1937-38.) Professor Mathews.

106a–106b. Special Topics in International Law.—Research course. Twice a week; both semesters. *One unit.* Professor Garner.

107. Foreign Relations of the United States.—Twice a week; first semester. *One unit.* Professor Mathews.

108. Problems of International Organization.—Special problems in the field of international organization, with particular attention to the League of Nations. Twice a week; second semester. *One unit.* Professor Berdahl.

112. Public Administration.—Special topics in national, state, or local administration in the United States. Twice a week; first semester. *One unit.* Professor Fairlie.

113. State Government: Research in Selected Topics.—First semester. *One unit.* (Not given in 1937-38.) Professor Mathews.

114. Political Parties.—Twice a week; first semester. *One unit.* Professor Berdahl.

121. Problems in British Government.—Once a week; time to be arranged. *One unit.* Professor Fairlie.

128. Contemporary Governmental Problems.—Twice a week; first semester. *One unit.* Assistant Professor Hyneman.

Courses for Graduates and Advanced Undergraduates

4. Municipal Government.—Three times a week; first semester. Associate Professor Kneier.

5. The American Constitutional System.—Three times a week; first semester. Professor Mathews.

6a. International Law.—Three times a week; first semester. Professor Garner.

6b. International Law.—(Continuation of 6a.) Three times a week; second semester. Professor Garner.

7. American Foreign Relations.—Three times a week; second semester. Professor Mathews.

8. International Organization.—Twice a week; second semester. Professor Berdahl.

9. Principles of Jurisprudence.—Three times a week; second semester. Professor Fairlie.

11. The Constitution and Industrial Legislation.—Three times a week; second semester. Assistant Professor Hyneman.

12. Public Administration.—Three times a week; first semester. Professor Fairlie.

13. Government Regulation of Business.—Three times a week; first semester. Assistant Professor Hyneman.

14a. Political Parties: Party History and Issues.—Three times a week; second semester. Professor Berdahl.

14b. Political Parties: Party Organization and Methods.—Three times a week; first semester. (Not given in 1937-38; alternates with Political Science 14a.) Professor Berdahl.

18. Legislation in the United States.—Three times a week; second semester. (Not given in 1937-38.)

21. British Government.—Twice a week; first semester. Professor Fairlie.

22. Continental European Governments.—The constitutions and political systems of the principal countries of continental Europe. Three times a week; second semester. Professor Garner.

28. Current Governmental Problems.—Twice a week; second semester. (Not given in 1937-38.) Professor Mathews.

32. Principles of Political Science.—Twice a week; second semester. Professor Fairlie.

34. Municipal Problems.—Municipal administration in the United States and Europe. Three times a week; second semester. Associate Professor Kneier.

PSYCHOLOGY

Graduate students who elect psychology as their major subject must have had standard courses, of university grade, both in general psychology and in the psychological laboratory. One general university course is the minimal requirement for graduate students who apply to the department for a minor subject.

Training in clinical psychology is provided by courses offered at the Institute for Juvenile Research in Chicago. The prerequisite to these courses is recommendation by the Department of Psychology and one year of graduate work with a major in psychology, or, in case of especially qualified students who have majored in psychology as undergraduates, one semester of graduate work. The minimum period of attendance at the Institute necessary for the Master of Arts degree is six months; and for the Doctor of Philosophy degree, one academic year. Recommended minors are education and sociology.

Courses for Graduates

103. Research.—Experimental investigations. Both semesters. *One-half to two units.* Professors Woodrow, Young, Culler; Associate Professor Higginson; Assistant Professor Anderson.

105. Seminar. — Discussion of current topics in their historical setting, with especial emphasis upon research problems. Both semesters. *One unit.* Professor Woodrow.

106. Neural Theory of the Psychological Functions.—Second semester. *One unit.* Professor Culler.

108. Quantitative Methods. — The logic of research methods in psychology. First semester. *One unit.* Professor Culler.

109. Problems of Motivation.—Discussion of current research and concepts within the field of motivation. Second semester. *One unit.* Professor Young.

The following courses (counted as courses in psychology when taken by candidates for advanced degrees in psychology) are offered at the Institute for Juvenile Research in Chicago by the Department of Criminology, Social Hygiene, and Medical Jurisprudence of the College of Medicine.

101. Research in Juvenile Behavior.—*One to three units.* Professor Schroeder.

102. Advanced Work in Juvenile Behavior.—*One to three units.* Professor Schroeder.

103. Special Abilities and Disabilities.—*One or two units.* Associate Professor Brown.

104. Psychological Tests.—*One or two units.* Associate Professor Brown.

105. Psychology of Behavior Problems.—*One or two units.* Associate Professor Brown.

Courses for Graduates and Advanced Undergraduates

5. Comparative Psychology.—A systematic survey of animal behavior with particular reference to the behavior of the vertebrates. Laboratory and discussion. Three times a week; first semester. Dr. McAllister.

9. Physiological Psychology.—The physiological basis of conscious experience. Twice a week; first semester. Professor Culler.

11. Learning and Comprehension. — Processes and functions in acquiring knowledge and skill. Twice a week; first semester. Professor Culler.

12–13. Minor Problems (Advanced Laboratory).—Application of methods suitable to new problems in general and comparative psychology. Three times a week; both semesters. Associate Professor Higginson.

14. Social Psychology.—Psychological factors in the control of group behavior and the adjustment of the individual to social situations. Three times a week; second semester. Dr. McAllister.

16. Genetic Psychology.—The psychological development of the individual with special reference to childhood. Twice a week; second semester. Assistant Professor Anderson.

17. History of Psychology.—Twice a week; first semester. Professor Young.

18. Perception.—Perceptual experience; recent revisions of perceptual theory including the doctrine of the *Gestalt.* Lectures and discussions. Twice a week; second semester. Professor Culler.

20. Systematic Psychology.—A critical study of contemporary systems: behaviorism, *Gestalt psychologie,* structural, functional and dynamic psychology. For seniors and graduates. Twice a week; second semester. Professor Woodrow.

21. Character and Personality.—An analysis of the non-intellectual aspects and determinants of mentality and conduct, with special applications to behavior problems and personnel psychology. Three times a week; first semester. Assistant Professor Anderson.

23. Abnormal Psychology. — Analytical consideration of types of behavior deviating from the normal. Three times a week; second semester. Dr. Brighouse.

28. Motivation.—Drive, purpose, attitude, desire, sentiment, social incentives as determinants of behavior; conflict and adjustment. Twice a week; second semester. Professor Young.

34. Individual Differences.—A study of the variation in the mental characteristics of individuals and of groups. Three times a week; first semester. Professor Woodrow.

RAILWAY ENGINEERING

The prerequisite for graduate work in railway engineering is the equivalent of the undergraduate courses required for the degree of Bachelor of Science in engineering in the branch of the subject in which registration is desired.

Undergraduate courses 5 and 8 (Railway Laboratory) may be taken for major credit (½ unit each) toward the master's degree in railway engineering. Certain other undergraduate courses may be taken for minor credit.

Courses for Graduates

102. Locomotive Design.—Economic and legal considerations; specifications; weight distribution; relation of steam pressure, compounding, and superheat to performance and economy. Once a week; first and second semester. *Two units.* Or, once a week; either semester. *One unit.* Professor Young.

106. Locomotive Operation.—Train resistance and locomotive tractive force; locomotive tonnage ratings. Once a week; first and second semester. *Two units.* Or, once a week; either semester. *One unit.* Professor Schmidt.

110. Railway Location.—Effect of location on earning capacity; problems in original location, relocation, and reduction of grades of existing lines. Once a week; first and second semester. *Two units.* Or, once a week; either semester. *One unit.* Professor King.

ROMANCE LANGUAGES AND LITERATURE

A student entering on graduate work for an advanced degree must have had at least three years of college work in his major subject, including one advanced literary course.

Students who enter with a knowledge of Latin and of a second Romance language, together with a reading knowledge of German, will find their work for an advanced degree greatly facilitated.

FRENCH

Courses for Graduates

101. Old French Literature.—Twice a week; both semesters. *One unit.* Professor Oliver.

102. Villon, Rabelais, Montaigne, La Pléiade.—Twice a week; both semesters. *One unit.* Assistant Professor Will.

103. Seventeenth Century Literature.—Twice a week; both semesters. *One unit.* Professor Oliver.

104. Eighteenth Century Literature.—Twice a week; both semesters. *One unit.* (Not given in 1937-38.) Professor Oliver.

127. French Romanticism.—Twice a week; both semesters. *One unit.* (Not given in 1937-38.) Professor Carnahan.

128. Origin and Development of the Novel in France.—Twice a week; both semesters. *One unit.* Professor Carnahan.

129. Research Problems in French Romanticism.—Twice a week; both semesters. *One unit.* Professor Carnahan.

132. French Symbolism in Prose and Verse and the English and American Influences.—Twice a week; both semesters. *One unit.* (Not given in 1937-38.) Professor Michaud.

133. Victor Hugo, His Influence and His Critics.—Twice a week; both semesters. *One unit.* Professor Michaud.

144. Le Réalisme et le Naturalisme Français.—(In French.) Twice a week; both semesters. *One unit.* (Not given in 1937-38.) Professor Michaud.

145. Doctrines Littéraires et Courants d'Idées Contemporains.—(In French.) Twice a week; both semesters. *One unit.* Professor Michaud.

175. Old French Phonology and Morphology.—Twice a week; both semesters. *One unit.* (Not given in 1937-38.) Professor Oliver.

195. Seminar.—Research work in special topics. Both semesters. *One to two units.* Members of the department.

Courses for Graduates and Advanced Undergraduates

10a–10b. General Survey of French Literature.—Three times a week; both semesters. Professor Carnahan.

17a–17b. French Drama of the Nineteenth Century.—Twice a week; both semesters. Associate Professor Hamilton; Assistant Professor Will.

24a–24b. French Drama of the Seventeenth and Eighteenth Centuries.—Three times a week; both semesters. Professor Oliver.

32a-32b. The French Novel of the Nineteenth Century.—Three times a week; both semesters. Assistant Professor Jacob.

33a–33b. La Littérature Contemporaine.—(In French.) Twice a week; both semesters. Professor Michaud.

35a-35b. Civilisation Française. (Développement de la Culture Française). —(In French.) Twice a week; both semesters. (Not given in 1937-38.) Professor Michaud.

ITALIAN

Courses for Graduates

140. Italian Literature in the Middle Ages. Petrarch, Boccaccio.—Twice a week; both semesters. *One unit.* Professor Van Horne.

143. Italian Literature in the Renaissance.—Twice a week; both semesters. *One unit.* (Not given in 1937-38.) Professor Van Horne.

146. Modern Italian Literature.—Twice a week; both semesters. *One unit.* (Not given in 1937-38.) Professor Van Horne.

195. Seminar.—Research work in special topics. Both semesters. *One to two units.* Professor Van Horne.

Course for Graduates and Advanced Undergraduates

3a–3b. Dante: The Divine Comedy.—Twice a week; both semesters. Dr. Dismukes.

SPANISH

Courses for Graduates

130. Spanish Literature in the Sixteenth Century.—Twice a week; both semesters. *One unit.* (Not given in 1937-38.) Professor Van Horne.

131. Spanish Literature in the Seventeenth Century.—Twice a week; both semesters. *One unit.* (Not given in 1937-38.) Professor Van Horne.

132. Galdós y su Época.—(In Spanish.) Twice a week; first semester. *One unit.* Associate Professor Balseiro.

133. Unamuno y su Época.—(In Spanish.) Twice a week; second semester. *One unit.* Associate Professor Balseiro.

134. Spanish Literature in the Eighteenth Century.—Twice a week; both semesters. *One unit.* Associate Professor Hamilton.

135. La Novela Española Moderna.—(In Spanish.) Twice a week; both semesters. *One unit.* (Not given in 1937-38.) Associate Professor Balseiro.

138. Spanish-American Literature.—Twice a week; both semesters. *One unit.* Professor Van Horne.

139. Spanish Literature in the Middle Ages.—Twice a week; both semesters. *One unit.* (Not given in 1937-38.) Associate Professor Hamilton.

185. Old Spanish Readings.—Twice a week; both semesters. *One unit.* (Not given in 1937-38.) Associate Professor Hamilton.

195. Seminar.—Research work in special topics. Both semesters. *One to two units.* Members of the department.

Courses for Graduates and Advanced Undergraduates

10a–10b. General Survey of Spanish Literature.—Three times a week; both semesters. Associate Professor Hamilton.

11a-11b. Cervantes: Don Quixote.—Twice a week; both semesters. Professor Van Horne.

17a–17b. El Teatro Español Moderno.—Twice a week; both semesters. Associate Professor Balseiro.

SOCIOLOGY

Preparation for major work in sociology must include at least the equivalent of twenty-three semester hours in the social and biological sciences, of which at least eight must be in sociology. The remaining fifteen hours may be distributed among economics, philosophy, history, psychology, political science, and biology (heredity). Preparation for graduate work in sociology as a minor requires at least six hours of credit in sociology.

Courses for Graduates

100. General Sociology.—Twice a week; first semester. *One-half to one unit.* Professor Hiller.

102. Recent Developments in Sociology.—Twice a week; second semester. *One unit.* Assistant Professor Albig.

106. Urban Communities and Urbanization.—Twice a week; first semester. *One unit.* (Not given in 1937-38.) Assistant Professor Tylor.

107. Rural Communities.—Twice a week; second semester. *One unit.* Assistant Professor Tylor.

108. Research in the Social Effects of Poverty, and Their Prevention and Treatment.—Twice a week; first semester. *One unit.* Assistant Professor Timmons.

109. Research in Criminology.—Twice a week; second semester. *One unit.* Professor Taft.

110. Population.—Twice a week; second semester. *One unit.* (Not given in 1937-38.) Professor Taft.

121. Folk Sociology.—Twice a week; second semester. *One unit.* (Not given in 1937-38.)

122. Regional Problems and Planning.—Twice a week; second semester. *One unit.* (Not given in 1937-38.)

124. Advanced Penology.—Twice a week; first semester. *One unit.* Professor Taft.

128. Fusion of Culture Resulting from Immigration.—Twice a week; second semester. *One unit.* (Not given in 1937-38.) Professor Hiller.

129. Modern Human Migrations.—Twice a week; first semester. *One unit.* (Not given in 1937-38.) Professor Taft.

150. Seminar and Research.—The field, type, and amount of work are to be adjusted to the needs of the student in the respective graduate years. *One-half to three units.* Members of the department.

Courses for Graduates and Advanced Undergraduates

3. Social Evolution.—Three times a week; first or second semester. Mr. Ahrens.

5. The Family.—Three times a week; first or second semester. Assistant Professor Timmons.

6. Urban Sociology.—Three times a week; first semester. Assistant Professor Tylor.

7. Rural Sociology.—Three times a week; second semester. Assistant Professor Tylor.

8. Charities.—Three times a week; first semester. Assistant Professor Timmons.

9. Criminology.—Three times a week; first or second semester. Professor Taft.

10. Population Problems and Human Ecology.—Three times a week; second semester. (Given in alternate years; not given in 1937-38.) Professor Hiller.

14. Group Opinion.—Three times a week; first semester. Assistant Professor Albig.

17. Methods of Sociological Research.—Three times a week; first semester. Professor Hiller.

18. Recent Developments in Public Welfare Administration.—Three times a week; second semester. Assistant Professor Timmons.

20. Social Progress and Social Values.—Three times a week; second semester. (Not given in 1937-38.)

24. Penology.—Three times a week; second semester. Professor Taft.

27. Community Welfare Organization.—Three times a week; second semester. Assistant Professor Timmons.

28. Immigration, Assimilation, and Culture Diffusion.—Three times a week; second semester. (Given in 1937-38 and in alternate years.) Professor Hiller.

29. Modern Human Migrations.—Three times a week; first semester. Professor Taft.

30. Races of Mankind.—Three times a week; first semester. (Not given in 1937-38.)

40. Ethnology of the American Indians.—Three times a week; first semester. (Not given in 1937-38.)

42. Primitive Societies.—Three times a week; first semester. Assistant Professor Albig.

44. The Negro.—Three times a week; second semester. (Not given in 1937-38.)

45. Prehistoric Archeology.—Three times a week; first semester. (Not given in 1937-38.)

THEORETICAL AND APPLIED MECHANICS

The prerequisite for the courses for graduates in theoretical and applied mechanics is the equivalent of the undergraduate courses in theoretical and applied mechanics required for the degree of Bachelor of Science in engineering.

Courses offered to senior students are open for minor credit to students majoring in other departments.

Courses for Graduates

101. The Development of Basic Ideas in Mechanics.—Twice a week; first semester. *One unit.* Professor Moore.

103. Hydraulics.—Twice a week; either semester. *One unit.* Professor Enger, Assistant Professor Kittredge.

107. Laboratory Investigations in Strength of Materials.—Twice a week; both semesters. *One-half to two units.* Professor Moore.

108. Laboratory Investigations in Hydraulics.—Twice a week; both semesters. *One to two units.* Professor Enger, Assistant Professor Kittredge.

109. Laboratory Investigations in Plain and Reinforced Concrete.—Twice a week; both semesters. *One to two units.* Professor Richart.

110. Analytical Study of Experimental Work on Reinforced Concrete.—Beams, frames, and footings. Twice a week; first semester. *One unit.* Professor Richart.

111. Analytical Study of Experimental Work on Reinforced Concrete.—Columns and slabs. Twice a week; second semester. *One unit.* Professor Richart.

112. Structural Mechanics.—Three times a week; first semester. *One unit.* Assistant Professor Schwalbe.

113. Selected Topics in Structural Mechanics.—Twice a week; second semester. *One-half unit.* (Not given in 1937-38.)

114. Theory of Elasticity with Applications to Engineering Problems.—Three times a week; first semester. *One unit.* Dr. Newmark.

115. Theory of Elasticity with Applications to Engineering Problems (Continuation of 114).—Twice a week; second semester. *One unit.* Dr. Newmark.

116. Resistance of Materials.—Three times a week; first semester. *One-half to one unit.* Professor Seely.

117. Properties of Engineering Materials.—Three times a week; second semester. *One-half to one unit.* Professor Seely.

198. Thesis.—Both semesters. *One unit.* Members of the department.

Courses for Graduates and Advanced Undergraduates

41. Advanced Mechanics of Materials.—Three times a week; first semester. Professor Seely, Mr. Dolan.

42. Engineering Materials.—Three times a week; second semester. Professor Seely, Mr. Collins.

43. Laboratory Work in Hydraulics.—Twice a week; first and second semesters. Mr. Lansford.

44. Laboratory Work in Testing Materials.—Twice a week; first and second semesters. Professor Putnam.

ZOOLOGY

At least sixteen semester hours of college work in zoology are required for entering on major graduate study in this subject. Under special circumstances advanced work in closely allied subjects may be accepted in lieu of the fourth semester's work in zoology. When zoology is chosen for a minor the courses listed for graduates and undergraduates must be preceded by at least one full year's undergraduate work in zoology.

For the prosecution of graduate study in zoology a reading knowledge of German and French is indispensable and familiarity with Latin and Greek is of great advantage.

Graduate students specializing in zoology are strongly advised to spend at least one summer in study at the seashore. Every candidate for the doctor's degree will be required to furnish evidence of having completed satisfactorily at least one six-week period in such work at an approved location.

Courses for Graduates

102. Evolution of Vertebrates.—Twice a week; first semester. *One unit.* (Given in 1937-38 and in alternate years.) Associate Professor Adams.

103. Cytology.—Twice a week; both semesters. *One unit.* (Given in alternate years; not given in 1937-38.) Professor Shumway.

106. General Embryology.—Problems of development. Twice a week; both semesters. *One unit.* (Given in 1937-38 and in alternate years.) Professor Shumway.

109. Physiological Ecology.—Twice a week; second semester. *One-half to one unit.* (Given in alternate years; not given in 1937-38.) Professor Shelford.

110. Climatic Ecology.—Twice a week; second semester. *One-half to one unit.* (Given in 1937-38 and in alternate years.) Professor Shelford.

111. Experimental and Field Ecology.—Saturdays; both semesters. *One-half to two units.* Professor Shelford.

115. Factors of Individual and Racial Development.—Twice a week; both semesters. *One unit.* Professor Zeleny.

117. Invertebrate Taxonomy.—Twice a week; second semester. *One-half to one unit.* Professor Van Cleave.

118. Advanced Protozoology.—Twice a week; second semester. *One unit.* Associate Professor Kudo.

131. Helminthology.—Twice a week; first semester. *One-half to one unit.* Professor Van Cleave and Assistant Professor Thomas.

Individual Research Courses

Note: These courses may be taken by students who can attend classes only on Saturdays.

121. Invertebrate Zoology and Parasitology.—*One to two units.* Professor Van Cleave and Assistant Professor Thomas.

122. Vertebrate Morphology.—*One to two units.* Associate Professor Adams.

124. Experimental Zoology and Genetics.—*One to two units.* Professor Zeleny, Dr. Luce, Dr. Hall.

125. Animal Ecology and Behavior.—*One to two units.* Professor Shelford, Assistant Professor Kendeigh.

126. Vertebrate Embryology and Cytology.—*One to two units.* Professor Shumway, Assistant Professor Adamstone.

128. Protozoology.—*One to two units.* Associate Professor Kudo.

Courses for Graduates and Advanced Undergraduates

11. Animal Ecology and Geography.—Three or four times a week; first semester. Professor Shelford.

17. Field Zoology.—Two or three times a week; first semester. Professor Van Cleave.

18. Protozoology.—Twice a week; first semester. Associate Professor Kudo.

19a–19b. Vertebrate Ecology.—Twice a week; both semesters. Assistant Professor Kendeigh.

20a–20b. Current Investigations.—Must be taken by all graduate students whose major is in zoology. Once a week; both semesters. Members of the department.

21a–21b. Introduction to Zoological Research.—Two to five times a week; both semesters. May be taken by students who can attend classes only on Saturdays. Members of the department.

22–23. Comparative Anatomy of Vertebrates.—Two to four times a week; both semesters. Associate Professor Adams.

25. Experimental Genetics.—Two or three times a week; second semester. Dr. Luce.

31. Helminthology.—Twice a week; second semester. Assistant Professor Thomas.

63. Comparative Vertebrate Embryology.—Two to five times a week; first semester. Professor Shumway.

66. Vertebrate Organogeny.—Two to five times a week; second semester. Professor Shumway.

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The Graduate School

Announcement for 1938-1939

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UNIVERSITY OF ILLINOIS
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GRADUATE SCHOOL CALENDAR

Graduate students will find it to their advantage to observe the dates in this calendar.

Summer Session

1938

June 20, Monday.....Registration day.
June 21, Tuesday.....Instruction begun.
July 8, Friday.....Latest date for registering for French and German examinations.
July 15, Friday.....Examination in French.
July 22, Friday.....Examination in German.
Aug. 6, Saturday, 12 M.....Latest date for candidates for degrees in August to deposit theses.
Aug. 12, 13, Friday, Saturday.....Summer Session examinations.

First Semester

Sept. 16, 17, Friday, Saturday.....Registration days.
Sept. 17, Saturday.....Latest date for registration of former students without penalty.
Sept. 17, Saturday.....Latest date for registering for French and German examinations.
Sept. 17, Saturday.....Latest date for candidates for Ph.D. degree in October to deposit theses.
Sept. 19, Monday.....Latest date for masters' degrees in October to file applications for degrees and to deposit theses.
Sept. 21, Wednesday, 8 A.M.....Instruction begun.
Sept. 30, Friday.....Examination in French.
Oct. 1, Saturday.....Latest date for Ph.D. finals for degree in October.
Oct. 7, Friday.....Examination in German.
Oct. 8, Saturday, 12 M.....Latest date for changing study-lists without fee.
Oct. 15, Saturday.....Latest date for preliminary examinations (for full residence).
Nov. 1, Tuesday.....Latest date for candidates for professional engineering degrees to file statements of professional study and experience.
Nov. 23, Wednesday, 12 M.....Thanksgiving recess begun.
Nov. 28, Monday, 1 P.M.....Instruction resumed.
Dec. 23, Friday, 12 M.....Holiday recess begun.
Dec. 31, Saturday, 12 M.....Latest date for candidates for professional engineering degrees to submit outlines of theses.

1939

Jan. 4, Wednesday, 1 P.M.....Instruction resumed.
Jan. 14, Saturday, 12 M.....Latest date for registering for French and German examinations.
Jan. 16, Monday.....Latest date for filing applications for masters' degrees to be conferred in February.
Jan. 16, Monday.....Latest date for candidates for Ph.D. degree in February to deposit theses.
Jan. 24, Tuesday.....Semester examinations begun.

1939

Jan. 27, Friday.....Examination in French.
Jan. 30, Monday.....Latest date for candidates for masters' degrees in February to deposit theses.
Feb. 1, Wednesday.....Semester examinations ended.
Feb. 3, Friday.....Examination in German.

Second Semester

Feb. 3, 4, Friday, Saturday.....Registration days.
Feb. 4, Saturday.....Latest date for registration of former students without penalty.
Feb. 8, Wednesday, 8 A.M.....Instruction begun.
Feb. 15, Wednesday.....Latest regular date for applications for scholarships and fellowships for 1939-40.
Feb. 25, Saturday, 12 M.....Latest date for changing study-lists without fee.
Feb. 28, Tuesday.....Latest date for preliminary examinations (for full residence).
April 1, Saturday, 12 M.....Latest date for filing applications for masters' degrees to be conferred in June.
April 6, Thursday, 12 M.....Easter recess begun.
April 11, Tuesday, 1 P.M.....Instruction resumed.
April 15, Saturday.....Latest date for registering for French and German examinations.
April 28, Friday.....Examination in French.
May 1, Monday.....Latest date for candidates for professional engineering degrees to deposit theses.
May 5, Friday.....Examination in German.
May 13, Saturday.....Latest date for filing applications for masters' degrees to be conferred in August.
May 13, Saturday.....Pre-registration for masters' degrees to be conferred in August.
May 15, Monday.....Latest date for candidates for Ph.D. degree in June to deposit theses.
May 26, Friday.....Semester examinations begun.
May 29, Monday.....Latest date for candidates for masters' degrees in June to deposit theses.
May 29, Monday.....Latest date for Ph.D. finals.
June 5, Monday.....Semester examinations ended.
June 12, Monday.....Sixty-eighth Annual Commencement.

Notes

Examination in one foreign language must be passed before residence on second year may be counted (pp. 13, 16).

Two copies of thesis are required of candidates for masters' and doctors' degrees (pp. 13, 17).

Candidates for masters' degrees announce thesis subjects at beginning of second half-year of work, or after completion of four units, or at beginning of third summer session (p. 13).

Candidates for Ph.D. degree announce thesis subjects within six weeks after beginning of third year of residence (p. 17).

Candidates for Ph.D. degree deposit theses two weeks before date of final examination (p. 17).

THE GRADUATE SCHOOL
EXECUTIVE FACULTY

ARTHUR CUTTS WILLARD, B.S., D.Eng., LL.D., *President of the University*

ROBERT DANIEL CARMICHAEL, Ph.D., *Professor of Mathematics and Dean of the Graduate School*

CLARENCE ARTHUR BERDAHL, Ph.D., *Professor of Political Science*

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WILLIAM ABBOTT OLDFATHER, Ph.D., LL.D., *Professor of the Classics*

WILLIAM SPENCE ROBERTSON, Ph.D., *Professor of History*

WORTH HUFF RODEBUSH, Ph.D., *Professor of Physical Chemistry*

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WILBUR M. WILSON, M.M.E., C.E., *Research Professor of Structural Engineering*

THE GRADUATE SCHOOL

History and Organization

The University of Illinois offered facilities for advanced study and research in various lines as early as 1872. Organized graduate instruction, however, under the name of the Graduate School, was first undertaken in 1892. In 1894 the administration of the school was vested in the Council of Administration, and the Vice-President of the University became Dean of the School. In 1906 the Graduate School was organized as a separate faculty.

By action of the Trustees the teaching faculty of the Graduate School includes all members of the University Faculty who give instruction in approved graduate courses. The affairs of the School, however, are in charge of the Executive Faculty.

Admission

Admission to the Graduate School may be granted to graduates of institutions whose requirements for the bachelor's degree are substantially equivalent to those of the University of Illinois and to applicants from other institutions approved by the Executive Faculty, as hereinafter provided. *Admission to the Graduate School does not, however, imply admission to candidacy for an advanced degree, and gives no right or claim to be so admitted. A mere accumulation of "credits" or "grades" is not sufficient.*

Admission to graduate courses may be granted only to those who have had the requisite undergraduate work in those courses or departments. But a student of mature age who satisfies the Dean and the department concerned of his ability to pursue graduate work in a given line may be enrolled in particular graduate courses, without reference to a degree, and permitted to carry on such study or investigation under the direction of a department of the University as the department shall recommend and the Dean approve.

Application blanks for admission may be secured from the Registrar of the University. Every applicant must submit with his application for admission an official transcript of his college record. All students, except those entering only for summer sessions, who have not previously taken a physical examination at the University, must take such an examination. The examination is given by the University Health Service without cost to the student, if taken at the time of appointment during the registration period.

Character of Graduate Work

The principal aim of graduate study is the development of the power of independent work and the promotion of the spirit of research. Each candidate for a degree is expected to have a wide knowledge of his subject and of related fields of work. The graduate student is not expected to get from lecture and laboratory courses all the knowledge and training necessary to meet the requirements for his degree.

Registration and Program of Study

The following regulations concerning registration and program of studies are laid out primarily for first-year students. Second-year and third-year gradu-

ate students fill out their programs irrespective of the unit value of courses, according to their needs, under the advice of their instructors.

Registration.—Each graduate student must register at the beginning of each semester. The registration of a new student may be accepted at any time provided the student is prepared to take up courses actually under way. Credit towards the fulfillment of the residence requirement dates, however, from the time of registration and not from the beginning of the semester or year in which the student enters.

A new student must fill out in duplicate an application for admission and submit it to the Registrar, from whom, after the approval of his application, he will receive a card of admission and a study-list which will give details of procedure in registering. He should fill out the study-list after consultation with his adviser, or the person in charge of his major work, and also with the instructors whose courses he wishes to elect. *Registration, including the payment of fees, must be completed by the close of the registration days of the Graduate School. Otherwise a fee of $5.00 for late registration will be charged all former students of the University of Illinois.*

Changes in Study-lists.—A graduate student is expected to plan his work so carefully that changes in his study-list during the semester will not be necessary. When a change seems advisable, however, it may be permitted without fee if made within three weeks of the date of registration. After that date a fee of one dollar is charged for each change, except that the total charge for rearrangement authorized on any one change slip shall not exceed two dollars.

Advanced Undergraduate Courses Open to Graduate Students.—The amount of graduate credit appropriate to these courses ranges from one-fourth to one unit. In the more elementary courses it should not exceed one-half unit. The actual amount in each case should be specified on the student's program by the department concerned, and is subject to approval by the Dean. Courses which are regularly open to sophomores may not be taken for graduate credit.

Seniors and Graduate Study.—If at the beginning of the second semester of his senior year a student who has been in residence at least one year is within five hours of a bachelor's degree, he may be permitted to register for courses which may count for residence for a master's degree, provided his program is limited to approximately twelve formal class, lecture, or laboratory exercises a week, and is approved by the Dean at the time of registration. Only students of excellent record will be allowed this privilege.

Miscellaneous and Listeners' Courses.—A graduate student in full standing and carrying a minimum program, may be permitted, under proper circumstances, to elect one miscellaneous subject (that is, a course which does not count towards an advanced degree). No subject is open as a miscellaneous course unless it has a specific educational bearing on the student's major or minor subjects of study. A student who elects a miscellaneous course is required to register in it, do the work, and pass the semester examinations, unless he is permitted to withdraw under the rules.

Graduate students are permitted to attend classes as listeners, providing a card bearing the approval of the adviser and instructor is filed at the Graduate

School office. A student who attends as a listener is not permitted to participate in the class work or the examination.

No student may register for a full minimum program of work for graduate credit if it is necessary for him to carry at the same time more than one miscellaneous subject.

Students on the Staff.—Assistants and others on the university staff who undertake to do graduate work are permitted to take an amount of work determined by the terms of their employment. Such a student, if required by his engagements to teach more than five classes a week or to have laboratory work or supervision exceeding ten hours a week, will find it impossible to complete the work for the master's degree in one year, or the doctor's degree in three years.

Residence and Work Done Elsewhere.—Continuous residence and study are required of all members of the Graduate School, unless they are granted leave of absence by the Dean, upon recommendation of the professor in charge of their work, for the purpose of carrying on elsewhere studies or investigation in the line of work for their degrees.

Graduate Study in the Summer.—Graduate students in the summer session are subject to the same scholastic requirements as those in the regular university year. Their study-lists must be approved by the Dean of the Graduate School, or his representative. Two to two and one-half units of graduate work may be taken in the summer session. Two units is considered a full minimum program for the summer. Attendance during four out of six consecutive summer sessions, or one semester and two summer sessions, is considered the equivalent of one year in residence. No course offered in the summer session may be taken for credit towards a higher degree unless it is described in the summer session circular as accepted for that purpose.

The Executive Faculty may, at the request of a given department, accord recognition to its summer session work subject to the following conditions: (1) Study in the University of Illinois summer session may be counted in partial fulfillment of the residence requirements for the degree of Doctor of Philosophy, but at least one continuous academic year of residence at the University at some time during the second or third years of the doctoral program is required. (2) Persons electing to use this plan shall be required to submit a schedule of study covering the second and third years of work toward the doctorate. This schedule of study must be approved by the adviser in charge of the major subject and by the Dean of the Graduate School. (3) Apart from the provisions stated above, the present practices and standards of the Graduate School relating to the doctorate shall be continued.

Graduate Work in Medical and Dental Sciences.—Graduate courses in medical and dental sciences are offered in the Colleges of Medicine and Dentistry of the University of Illinois, and summer courses are offered in the College of Medicine. Circulars describing the courses offered and conditions of admission and work may be obtained from the Committee on Graduate Work in the College of Medicine, 1853 West Polk Street, Chicago.

Failures.—A graduate student who fails in any course in his major subject

cannot secure his degree in the same year in which the failure occurred. No condition examinations are given graduate students.

Withdrawal.—If after registration a graduate student wishes to withdraw from any course or to add other work, he must first secure the necessary papers from the Dean's office. See the regulations concerning changes in study-lists, page 10. If he wishes to withdraw from the University he must get clearance papers at the Dean's office.

Masters' Degrees

Character of Masters' Degrees.—The master's degree conferred depends upon the character of the bachelor's degree. The usual practice is that A.M. shall follow A.B., and that M.S. shall follow B.S. However, this practice may be departed from in cases where the undergraduate course of study of the candidate was of a kind for which some reputable institutions in this country give A.B., while others give B.S.

Amount of Work Required.—Candidates for the degree of Master of Arts or Master of Science are required to do at least one full year's work in residence, usually including a thesis. Four to five units constitute a normal semester program for the master's degree. A minimum of eight units must be completed for the degree. Only first-rate students are permitted to secure a degree with this minimum program. In some departments special examinations are required of candidates for masters' degrees. In all cases the student must satisfy the duly approved conditions set by his major and minor departments.

Unless otherwise permitted, every student must take each semester at least one course open to graduate students only (courses numbered 100 and upwards).

In the first year of his graduate study each student is required to attend a minimum of four formal class, lecture, or laboratory exercises a week. Schedules involving an unusually large number of formal class meetings per week will require the special approval of the Dean.

Work Done Elsewhere.—Members of the staff and high school teachers residing and employed in Urbana or Champaign who have done graduate work in approved institutions elsewhere may secure credit not to exceed four units towards the master's degree by passing examinations in that work. They may complete the work for the degree by securing at least four units more while registered in the Graduate School for not less than one academic year.

Graduate students who have been in residence one semester or its equivalent may offer for credit not more than nine weeks of work at a marine or fresh-water biological laboratory or in biological or geological field work, on condition that the work be of graduate grade under a qualified instructor or director as certified by the student's major adviser and approved by the Dean of the Graduate School; that approval be obtained by the student in advance; and that a written report of the work accomplished be presented by the student and approved as satisfactory by the student's major adviser.

Majors and Minors.—A candidate for a master's degree may do all his work in one subject, or he may select a major and one minor, or a major and two minors. A major or minor denotes the field of knowledge of a department, or such part thereof as constitutes a separate and independent division of that field. For a master's degree a major is at least half the work, or a minimum of

four units, for one year. Less than one unit may not be counted as satisfying the requirements of a minor without the approval of the department concerned.

FOREIGN LANGUAGE.—The ability to use one or more of the modern languages ordinarily studied in the undergraduate curriculum is desirable for all candidates for the master's degree, and in some lines of study is required. No student will be permitted to acquire residence toward the second year for the doctorate until he has passed the preliminary examination in at least one of these languages.

MASTERS' THESES.—Each candidate for a master's degree is required to present two copies of a thesis on some subject approved by the professor in charge of his major work. Such approval, except in case of students working for masters' degrees in summer sessions only, must be secured and the subject of the thesis filed at the office of the Graduate School not later than the beginning of the second half-year of residence. Students working for masters' degrees exclusively in summer sessions must announce their thesis subjects not later than the beginning of their third session in residence. The requirement of a thesis may be waived, however, on the recommendation of the professor in charge of his major work and the approval of the Dean, *provided application to waive the thesis is made at the time for announcing thesis subjects.* A student excused from writing a thesis must replace it with courses of instruction.

No one will be excused from writing a thesis unless one-half of his program of studies consists of courses numbered 100 and upwards.

The thesis required from a candidate for a master's degree will ordinarily demand from one to two units of work, and may not exceed three units except by special permission. The thesis must be typewritten, on "thesis paper,"[1] and the title page must be printed. The carbon copy may be on plain paper of approximately the same weight as the thesis paper. Both copies of the thesis in its final form, together with a certificate of approval by the proper officer, must be left at the Dean's office at least two weeks before the date on which the degree is to be conferred. No article prepared for another use, or previously published, will be accepted as a thesis.

APPLICATIONS FOR DEGREES.—Each candidate for the degree of Master of Arts or Master of Science shall file an application for the degree on a blank provided for the purpose, to be had at the Dean's office. For the dates of applications and of deposition of theses, consult the calendar at the beginning of the bulletin.

DEGREES IN AUGUST.—Students who expect to become candidates for the master's degree in August may be recommended at the June meeting of the senate subject to the successful completion of the work for which they are to register in the summer session. However, in order to avail themselves of this privilege, students must file with the Dean before the June meeting of the Senate an exact statement of the work necessary to complete the requirements for the degree. Blanks for this purpose may be secured at the Dean's office. For the dates of filing application and pre-registration blanks, consult the calendar at the beginning of the bulletin.

THESIS WORK ON LEAVE OF ABSENCE.—Under proper conditions a student may be permitted to complete the last fourth of his work, if devoted to his thesis, under leave of absence for a period not to exceed the equivalent of two

[1]No other will be accepted by the Dean. "Instructions for the Preparation of Theses" may be obtained at the Dean's office.

semesters. To get such permission the student must have secured credit for a least six units; must petition for the privilege; must submit to the Dean a outline of the proposed investigation, approved by the professor in charge of hi major work, and must submit satisfactory evidence that adequate facilities ar available to him at the place where he intends to do the proposed work. Approva on all these points must be obtained one collegiate year before the thesis is due Immediately following approval the student must register and pay an incidenta fee of $20.00.

GRADES.—Students' work is graded in five classes, A, B, C, D, and E. Th last indicates a failure. D indicates unsatisfactory, though passable, work.

A student who receives two units of a grade below B during his first yea of graduate work may not complete the first year of residence by carrying th minimum program of eight units for the master's degree. Three units of grade below B disqualify a student as a candidate for a degree.

A failure or absence from examination in any course or failure in any othe examination prescribed by the department of the major may prevent the con ferring of the degree; and, as already indicated, failure in any course in th major field precludes the conferring of the degree in the same year.

Master of Business Administration

(See page 32 for description.)

Second Degrees in Engineering

Two classes of second degrees are open to graduates of the College of En gineering, namely, academic and professional.

The *academic* second degree in engineering is Master of Science, followin Bachelor of Science, in civil engineering, electrical engineering, etc. This degre is conferred in accordance with the regulations described above for *academi work in residence only.*

The *professional* second degrees in engineering are as follows:

Master of Architecture, after B.S. in architecture.

Architectural Engineer, after B.S. in architectural engineering.

Ceramic Engineer, after B.S. in ceramic engineering.

Chemical Engineer, after B.S. in Chemical Engineering.

Civil Engineer, after B.S. in civil engineering or in railway civil engineering

Electrical Engineer, after B.S. in electrical engineering or in railway elec trical engineering.

Mechanical Engineer, after B.S. in mechanical engineering or in railway me chanical engineering.

Engineer of Mines, after B.S. in mining engineering.

Engineer-Physicist, after B.S. in engineering physics.

Professional degrees in engineering may be conferred on two classes o candidates: (1) those who have received an academic degree in engineerin from the University of Illinois; (2) those who have received an academic degre in engineering[1] from other institutions of equal standing and who have bee members of the teaching or research staff of the College of Engineering o Engineering Experiment Station or the Department of Chemistry of the Uni versity of Illinois for at least three years prior to the conferring of the pro fessional degree.

[1]Including chemical engineering.

A candidate declares his candidacy by filing with the Dean of the College of Engineering, as chairman of the committee in charge, a detailed statement covering his professional engineering experience. This statement must be made upon a standard form supplied by the Dean of the College of Engineering, as chairman of the committee in charge, and must be filed not later than the first Monday in November preceding the commencement at which the candidate expects to receive the degree. No statement of experience will be considered by the committee which does not show that the candidate has had a minimum of four years of acceptable engineering experience after receiving the degree of Bachelor of Science, and that for at least three years he has been in responsible charge of engineering work. Responsible charge in engineering teaching may be considered as responsible charge of work. In determining the acceptability of the engineering experience of the candidate the committee will be guided by the character of his professional work and the degree of responsibility involved, and will take into consideration such evidences of professional ability and growth as may be shown by his investigation of engineering problems, his contributions to technical literature, and his membership and activity in engineering societies.

If the professional experience of the candidate is accepted he must submit for approval, prior to December 31, an outline of his proposed thesis. The completed thesis, in the form prescribed in the "Instructions for the Preparation of Masters' and Doctors' Theses," must be deposited with the Dean of the College of Engineering not later than May 1. The candidate must present himself at commencement in order to receive the degree.

A candidate for a professional engineering degree must pay the incidental fee of twenty-five dollars on being notified that his professional experience is accepted as qualifying him to enter as a candidate for the degree. No one will be enrolled as a candidate for the degree at the following commencement who does not pay his fee at this time. When a candidate for a professional engineering degree has once been accepted and paid his fee, he is eligible to receive the degree at any time within five years, without additional fee, on completion of the requirements; provided, however, that unless he completes the requirements within two years his name will be dropped from the list of candidates and in order to receive the degree within the five-year period he must register once more.

The Degree of Doctor of Philosophy

Major and Minor Subjects.—A member of the Graduate School who desires to become a candidate for the degree of Doctor of Philosophy is required to pursue a major subject in the department in which his research lies. He is also required to choose one minor subject, or he may choose two. If one minor only is chosen it must be taken in a department of study other than that of the major, and credit for it may be earned by work representing not less than four units, or one-sixth of the total residence required for the doctorate. If two minors are chosen, one must be a subject closely related to the major. With the approval of the adviser and the Dean it may be a division of the major field of study. The other minor (not less than two units) must, in that case, be taken in a department of study other than that of the major.

Except by special permission of the Dean the preliminary examination in major and minor subjects may not be taken until the minor work has been done.

Method of Computing Residence.—Credit for a full year of graduate work means that the student has during that time devoted all his working time and energy to study of a graduate grade. After the first year of residence, credit is not recorded in units, and there is no fixed correspondence between credit and courses as in undergraduate work.

Period of Study.—The normal *minimum* period of study required for securing the degree of Doctor of Philosophy is three years, during which the student is required to devote all his working time to his studies. All three years must be spent in resident graduate study at some accredited educational institution and either the first two or the last one of the three must be spent at the University of Illinois. The degree is conferred, however, not for residence during a certain period, but for scholarly attainments and power of investigation, as proved by a thesis and examinations. For study in summer sessions, see page 11.

Work Done in Other Universities.—Credit for graduate work done in other universities is not "transferred." However, it may be accepted on examination as equivalent to resident work at the University of Illinois, provided the institution in which it was done is of high standing.

Preliminary Examinations.—

A. In Languages.—The student will be required to demonstrate his ability to read French and German and other languages needed in his work. (In special cases the Executive Faculty, upon recommendation of the student's adviser, may substitute for either one of the languages usually required some other language which can be shown to be more useful in that student's professional research.) No student will be permitted to acquire residence towards the second year of graduate study until he has passed the examination in at least one of these languages. Both the examination in French and that in German must be passed before the student is admitted to the preliminary examination in his major and minor subjects. For the dates of these language examinations consult the calendar at the beginning of this bulletin. See calendar for date when application for admission to these examinations must be made.

B. In Major and Minors.—Towards the end of his second year of study, or by special permission, at the beginning of his third year (not later than about October 15), a student who wishes to become a candidate for the degree must submit to a preliminary examination conducted by a committee appointed by the Dean. This examination is intended to test the student's knowledge of the field of his major and minor subjects of study and to determine whether he is prepared for the final year of work for the doctorate. It is partly oral, and may be wholly so.

The student will not be admitted to his preliminary examination until the faculty is satisfied that he has finished substantially the equivalent of two years graduate work. He must do a full year's graduate work between his preliminary examination and the completion of his work for the doctorate.

Final Examination.—At least two weeks before the time when the degree is conferred, the candidate must submit to a final examination, given by a committee appointed by the Dean. This examination is primarily on the research work of the student, as embodied in his thesis, but it is not confined to that. I

extends to the whole field of study of the candidate. It will not be confined to the courses which the candidate has attended in the University of Illinois only, if he has done part of the work elsewhere; nor even to the field covered by the courses specifically taken in this or other universities; but will be so conducted as to determine whether the candidate has a satisfactory grasp of his major subject as a whole, and a general acquaintance with the fields of knowledge represented by his course of study.

The final examination may not be divided. The examination must be taken all at one time even though it requires several sessions.

If after having passed his preliminary examination, he fails in the third year of his study to meet the expectations of the professors in charge of his work, or in any way fails to maintain the standard of scholarship and power of research expected of him, he may be refused admission to the final examination.

Other Examinations.—Before the candidate is admitted to the final examination and the defense of his thesis, he may be required to take any other examination, oral or written, that is thought proper by the various departments in which he has studied.

The above examinations are in addition to those in the courses for which the student is registered. These must be taken at the time for which they are set in the examination schedule.

Thesis.—The power of independent research must be shown by the production of a thesis on some topic connected with the major subject of study. The candidate is expected to defend his thesis or dissertation before the members of the faculty, or as many of them as may wish to question him about it, in connection with his final examination.

The subject of the thesis should be chosen not later than the end of the second year of residence and must be submitted for formal approval by the faculty not later than six weeks from the beginning of his third year of residence.

Two typewritten copies of the complete thesis, *the original on thesis paper,*[1] and the first carbon on plain paper of approximately the same weight, and in final form, must be deposited in the office of the Dean for presentation to the examining committee not later than two weeks prior to the final examination and not less than four weeks before the time when the degree is conferred. At the same time, the candidate must deposit with the Dean a manuscript of the essential part, or an abstract, or a digest of his thesis, in condition for publication at a cost not to exceed seventy-five dollars ($75). The manuscript must be sufficient to show the method followed, the evidence used, and the conclusions reached in the investigation, and must bear the approval of the department and the Executive Faculty of the Graduate School.

The candidate must pay to the Comptroller before graduation the sum of seventy-five dollars ($75) out of which the University will print at least one hundred copies of this manuscript for circulation by the University, unless the thesis entire or in abbreviated form is published by the author or is accepted for publication by a standard journal or publisher within a year from the date of graduation. In the latter event, and after one hundred copies have been printed to the University by the writer, the cash deposit shall be returned to him.

[1]No other will be accepted by the Dean.

The typewritten and printed forms of the thesis must comply with the regulations given in "Instructions for the Preparation of Masters' and Doctors Theses," copies of which may be obtained at the Dean's office.

Degree of Doctor of Philosophy in Engineering

The degree of Doctor of Philosophy in Engineering is offered in certain lines of academic work of a high scholastic type in engineering science for students who wish to prepare themselves as teachers, investigators, and experts.

The general requirements for this degree, as to preliminary education, linguistic attainments, etc., are the same as in other subjects.

The following lines of engineering science, or others approved by the Graduate School, may be elected as majors:

Engineering mechanics
Steam engineering
Hydraulic and sanitary engineering
Electrical engineering
Heating and ventilation engineering
Railway engineering
Masonry construction and structural engineering
Coal-mining engineering
Ceramic engineering
Chemical engineering

The first minor may be any of the above or one of the following sciences or an authorized combination of two of them:

Theoretical mechanics
Mathematics
Thermodynamics
Bacteriology
Chemistry
Geology
Physics (experimental or mathematical)
Zoology
Botany
Economics

The second minor should be in other than engineering subjects.

Agricultural and Engineering Experiment Stations

Attention is called to the unusual opportunities for graduate study in connection with the Agricultural and Engineering Experiment Stations. By undertaking a line of graduate study in close association with some one of the projects carried on in those Stations, the student will come into contact with aspects of his specialty which he would rarely touch in a purely academic study and he will thus broaden his outlook. The Experiment Stations make available apparatus, equipment, and the services of mechanicians, which may materially facilitate the carrying on of investigations.

Scholarships and Fellowships

A number of scholarships and fellowships have been established by the Trustees of the University open to candidates who are not over thirty years

of age at the time when the appointment is to be made. To first-year graduate students of ability and promise there are open a number of scholarships with stipends of $300 and carrying exemption from the payment of tuition, incidental, and laboratory fees. There are two classes of fellowships—University Fellowships and Honorary Fellowships. The first are open to second-year and third-year graduate students with stipends of $500 and $600, respectively. To be eligible for a $600 fellowship an applicant must have passed both language examinations before the date for filing applications and must be prepared to take the preliminary examination in his major and minor subjects by the following June. Honorary Fellowships carry no stipends and no exemption from the payment of fees. Their purpose is to give recognition to superior students who are not in need of financial assistance.

Candidates for these scholarships and fellowships must be graduates of the University of Illinois, or of colleges or universities having equivalent requirements for bachelors' degrees.

Application must be made on blanks to be obtained from the Dean of the Graduate School. These application forms should be sent to the Dean of the Graduate School as early as possible in February of the academic year preceding that for which the fellowship is desired. No application will be considered if received later than February fifteenth, until after April fifteenth, the date when appointees from the first list of applications must accept or refuse their appointments.

Persons appointed are notified on April first and must send the Secretary of the Board of Trustees notice of their acceptance or refusal by April fifteenth; and must agree that, if accepted, the appointment will not be resigned to take a similar one in any other institution during the year for which it is awarded.

Nominations to fellowships are made on the grounds of worthiness of character, scholastic attainments, and promise of success in the principal line of study or research to which the candidate proposes to devote himself.

Research Graduate Assistantships in the Engineering Experiment Station

The Engineering Experiment Station is devoted to the study of problems of special importance to engineering and to manufacturing, railway, mining, and industrial interests, and the stimulation and elevation of engineering education. Approximately fourteen research graduate assistantships with a nominal stipend have been established, open to graduates of approved technical schools and universities. Applicants to whom these graduate assistantships are awarded agree to hold them for two years, devoting one-half their time to the work of the Engineering Experiment Station. At the end of this period, if all requirements have been met, the degree of Master of Science will be conferred. Several additional assistantships are usually maintained by industrial organizations. Applications for graduate assistantships should be made to the Director of the Engineering Experiment Station not later than March 1.

Libraries

The general university library, including the departmental libraries and reading rooms listed below, is located at the University in Urbana. The libraries of the College of Pharmacy and the College of Medicine are in Chicago.

These libraries contain about 1,110,000 volumes and about 300,000 pamphlets. Of these, 1,050,000 books and 300,000 pamphlets are in the libraries at Urbana; the rest are in Chicago. The library at Urbana also contains about 3,800 maps and 10,300 pieces of sheet music. Over 8,000 periodicals are currently received, including over 200 newspapers published in Illinois and about 125 foreign language newspapers published in the United States.

The general library of the University is open daily, from 8 a. m. until 10 p. m. and on Sunday from 2:30 p. m. until 5:30 p. m.

In the book stacks are 140 cubicles for the use of faculty members and graduate students.

A number of departmental and college libraries and reading rooms are maintained in the library and in other buildings on the campus; these libraries do not necessarily contain all the books in the respective subjects. In some instances they are primarily for the use of the graduate students and advanced undergraduate students in the departments using the respective buildings. The principal departmental libraries and reading rooms are the following:

Name of Library	*Location*	*Volumes*
Philosophy, Psychology, and Education	Library Building	7,600
Classics	Library Building	26,000
Modern Languages	Library Building	9,000
English	Library Building	6,800
Seventeenth Century Book Room	Library Building	6,000
History and Political Science	Library Building	14,000
Economics, Sociology, and Commerce	Library Building	4,600
Natural History	Natural History Building	57,500
Law	Law Building	56,100
Architecture, Ricker Library of	Architecture Building	12,500
Agriculture	New Agriculture Building	25,800
Chemistry	Chemistry Building	15,400
Physics	Physics Building	1,600
Mathematics	Mathematics Building	12,300
Engineering	Engineering Hall	36,700
Landscape Architecture	New Agriculture Building	5,200

The library includes most of the bibliographical aids published for the book-trade in this and other countries; a Union Card Catalog numbering over 2,750,000 cards, chiefly of books in seven other large American libraries; many printed catalogs of important libraries, e.g., Catalogue of Printed Books in the British Museum, Gesamtkatalog der Preussischen Bibliotheken, and Catalogue Général des livres imprimés de la Bibliothèque Nationale; and many bibliographies of special subjects.

The following brief statements indicate the resources of the library for research in a few subjects selected at random:

Official publications of municipalities number about 32,500 reports, charters, and ordinances, issued by over 3,000 American and 300 foreign municipalities, and more or less complete files of about 50 municipal periodicals. Systematic attempts are made to secure current publications, especially of Illinois municipalities.

Mathematics numbers 12,300 volumes, about 9,500 dissertations and other pamphlets, and includes files of over 300 periodicals and other serials.

Chemistry includes about 11,000 volumes of bound periodicals, 4,700 other books, 1,500 pamphlets, 7,200 theses, and receives currently 255 journals, most of which are complete sets.

Italian history includes the Cavagna Library, 40,000 volumes, pamphlets, and maps, and 138 bundles of manuscripts with typed partial index to families and places dealt with; much material of Italian local history, biography, and genealogy.

Classical literature, history, and archaeology embraces approximately 30,000 volumes, including complete sets of about 150 journals and serials; the library of Professor Wilhelm Dittenberger, of Halle, 5,600 items acquired in 1907; the library of Professor Johannes Vahlen, of Berlin, 10,000 items acquired in 1913; and a collection of about 17,000 dissertations, reprints, etc.

The Ricker Library of Architecture numbers 12,500 volumes, 10,900 lantern slides, and 9,000 photographs and drawings. It is not only a good working library for faculty and students in architecture, but contains many of the older and rarer works.

The Seventeenth Century Book Room houses about 6,000 volumes, including the Milton collection of approximately 1,500 volumes, and other titles relating to the literary, political, and religious life of seventeenth century England, especially the Milton period.

The newspaper collection contains 14,600 bound volumes of general newspapers. Included in it are files of 220 newspapers published in Illinois, generally complete since 1912, and 135 foreign language newspapers published in this country, generally complete since 1916. In the latter group are newspapers in 30 different languages.

Fees and Expenses

Except as noted below, graduate students pay fees as follows:

Matriculation fee	$10.00
Incidental fee, each semester, for residents of Illinois	35.00
All students, not residents of Illinois, pay each semester an incidental fee of	62.50
Incidental fee for students registered for thesis work towards the master's degree on leave of absence	20.00
Graduation fee	10.00
For late registration	5.00
For change in study-list	1.00

All persons on University appointment or on appointment in allied surveys and laboratories in Urbana and the research and educational hospitals in Chicago, eligible for admission to University work, also superintendents, principals, and teachers employed in the public school systems of Illinois and teachers and members of the staff in colleges and universities in this state, when admitted to instruction in the University during the period of their employment, may be permitted to attend University classes for credit, on condition that they register and pay either the regular incidental fees in the Graduate School, or, at their election, fees assessed as follows:

For undergraduate and professional work in the colleges and schools at Urbana, $2.50 a credit hour.

For graduate work at Urbana or Chicago, at the rate of $10 a unit; provided, however, that persons on scholarship or fellowship appointment in the Graduate School, or on University appointment at a salary of $1,600 a year

or less, who are registered in the Graduate School, shall be exempt from the payment of such fees, and from laboratory fees, in courses for graduate credit.

All persons shall pay the matriculation and graduation fees.

Table board may be obtained at prices ranging from $5 to $7 a week.

Room rent, single room, ranges from $15 to $25 a month; double room, from $10 to $15 a month, each person.

DEPARTMENTS OF INSTRUCTION

Courses open to graduate students are of two classes. The first class is wholly of graduate grade, and the courses are numbered 100 upwards. The second class includes the courses classified as for graduates and advanced undergraduates. These carry numbers below 100. The courses numbered 100 and upwards are all accepted for major credit. Those of the other group are in many cases accepted for minor credit only. This is especially true of courses which are open to juniors.

All courses have certain prerequisites for admission. Inasmuch as the prerequisite preparation may be gained at other institutions from courses differing from those offering a similar preparation at the University of Illinois, so that a statement of prerequisites as given here would not be understood elsewhere, their description is omitted altogether. However, a student who wishes to enter a particular course must satisfy the department concerned that he has had in some form the prerequisites for admission to the course.

For the convenience of first-year students the credit value of graduate courses is given in units. These values have no significance for second-year and third-year students.

The credit received for "courses for graduates and advanced undergraduates" is in accordance with the regulations of the Graduate School (see page 10).

Students are admitted to graduate standing in agriculture who have had a thorough training in the sciences underlying agriculture, and who are otherwise eligible to the Graduate School, even though their undergraduate course of study lacked to some extent the amount and kind of technical work in agriculture included in the course of study for the bachelor's degree in agriculture at the University of Illinois.

AGRICULTURAL ECONOMICS

Graduate students in agricultural economics may do their work in the general field of agricultural economics or specialize in any one of the following: (1) farm organization and management; (2) land economics; (3) agricultural marketing; and (4) agricultural prices and statistics.

Graduate work in agricultural economics as a major subject is open to students under either of two conditions: (1) the student must have done at least 20 hours of undergraduate work in economics, agricultural economics, business organization and operation, accountancy, history, political science, or sociology, of which at least 12 hours must have been in the field of economics and agricultural economics; or (2) the student must have had a thorough training in the principles of agricultural economics consisting of at least 12 hours credit in economics and agricultural economics, either in connection with or in addition to a course of study in agriculture substantially equivalent to that required for the bachelor's degree in agriculture in this University.

To take agricultural economics as a minor, the student must have had at least 20 hours work in agricultural and economic subjects. Two units in agricultural economics will be accepted as satisfying this requirement.

Graduate students who are making agricultural economics their major are required to take at least one course in advanced economic theory. Where such students are taking two minors in other departments, one of them must be in economics, business organization and operation, accountancy, sociology, history, or political science.

Certain courses given in other departments are closely related to those in agricultural economics. A graduate student whose major is in agricultural economics may be permitted, on approval of the departments concerned, to take such courses as part of his major work. Attention is called to graduate courses in economics, accountancy, business organization and operation, and sociology, as well as those in other departments in the College of Agriculture.

Courses for Graduates

103. Personnel Relationships in Teaching, Research, and Extension Work.—See Animal Husbandry 103 and Agronomy 119. (Not given in 1938-39.)

109. Seminar. Thesis Course.—All graduate students majoring in Agricultural Economics must register in Agricultural Economics 109; credit is conditional upon the completion of an acceptable thesis. Once a week; both semesters. *One to two units.* Members of the department.

110. Agricultural Economics Theory.—Twice a week; both semesters. *One unit.* Professor Stewart.

111. Agricultural Prices and Statistics.—Twice a week; continuous through both semesters. *One unit.* Associate Professor Working.

112. Agricultural Economics Research.—Credit is conditional upon the completion of an acceptable report of investigation. Once a week; both semesters. *One to two units.* Members of the department.

120. Farm Management Principles and Investigational Methods.—Twice a week; first semester. *One unit.* Professor Case.

135. Problems in the Marketing of Agricultural Products.—Three times a week; second semester. *One unit.*
   (a) Grain, Livestock, and General Agricultural Marketing.—Professor Norton.
   (b) Horticultural Products.—Professor Lloyd.
   (c) Dairy Products.—Assistant Professor Bartlett.

Courses for Graduates and Advanced Undergraduates

10. Economic Relationships of Agriculture.—Three times a week; first semester. Professor Stewart.

11. Agricultural Prices and Statistics.—Three times a week; second semester. Associate Professor Working.

14. Cooperation in Agriculture.—Three times a week; second semester. Assistant Professor Bartlett.

15. Financing Agriculture.—Three times a week; first semester. Professor Norton.

17. Economic History of Agriculture.—Twice a week; first semester. (Not given in 1938-39.)

18. Land Economics.—Three times a week; second semester. Professor Stewart.

22. Types and Systems of Farming.—Required field trip, expense about $3. Three times a week; first semester. Associate Professor Wilcox.

23. Farm Business Analysis.—Required field trip, expense about $5. Three times a week; second semester.

24. Farm Operation.—Required field trip, expense about $3. Twice a week; first semester. Associate Professor Ross, Mr. Hurt.

25. Farm Organization.—Required field trip, expense about $5. Three times a week; second semester. Professor Case, Dr. Ackerman.

26. Farm Administration.—Twice a week; first semester. Professor Case, Dr. Ackerman.

31. Grain Grading and Marketing.—Required inspection trip, expense about $10. Three times a week; first semester. Professors Norton, Pieper.

34. Marketing Dairy Products.—Inspection trip required; estimated cost, $15. Twice a week; second semester. Assistant Professor Bartlett.

36. Marketing Horticultural Products.—For seniors and graduates specializing in horticulture. Inspection trip required; estimated cost, $12. Three times a week; first semester. Professor Lloyd.

37. Marketing Livestock.—Twice a week; second semester. Professor Ashby.

42. Farm Appraisals.—Local field trips to be arranged; estimated cost, $5. Four times a week; second semester. Members of departments involved.

AGRONOMY

Graduate students may take work in agronomy leading to the M.S. and Ph.D. degrees. They may specialize for either degree in soil fertility, soil physics, soil biology, plant breeding, or crop production.

For either degree, if two minors are chosen, the first should be, and both first and second may be, taken in a department other than agronomy. If only one minor is chosen, it must be in a field outside of the department.

A candidate for the master's degree in agronomy must present an acceptable thesis, and show proficiency in his work as demonstrated by suitable examinations, prescribed by the department.

Fifteen college credits in agronomy and related subjects are prerequisites for a minor, and five additional credits are prerequisites for a major. Students must have had the fundamental work in science, prerequisite to the major and minor fields of study. Those with unusually good training in science may be permitted by the department to waive certain of the above mentioned requirements.

Courses for Graduates

101. Chemical Properties of Soils; Their Relation to Soil Development and Plant Growth.—Twice a week; first semester. *One unit.* Professor DeTurk.

104. Seminar.—Once a week; both semesters. *One-fourth unit.* The Graduate Staff.

112. Theory and Analysis of Plant Breeding Problems.—Three times a week; second semester. *One unit.* Professor Woodworth.

114. Principles Underlying the Production of Crops.—Twice a week; second semester. *One unit.* Professors Burlison, Dungan.

118. Research.—A special problem is chosen by each student. Graduate students writing theses should so indicate in registering in Agronomy 118. Both semesters. *One-half to four units.*

(a) Soils.—Professors Bauer, DeTurk, R. S. Smith.
(b) Crops.—Professors Burlison, Woodworth, Dungan, Pieper.

119. Personnel Relationships in Teaching, Research, and Extension Work. —See Animal Husbandry 103.

Courses for Graduates and Advanced Undergraduates

7. Crop Production as Affected by Environmental Factors.—Three times a week; first semester. Professors Burlison, Dungan.

10. Genesis, Morphology, Classification, and Geography of Soils.—Three times a week; second semester. Professor R. S. Smith.

11. Rôle of Microorganisms in Soil Fertility.—Three times a week; first semester. Associate Professor Sears.

13. Soil Productivity, its Variation, Modification, and Maintenance.—Three times a week; second semester. Professor Bauer.

14. Grain Grading and Marketing.—See Agricultural Economics 31.

22. Improvement of Farm Crops by Breeding.—Three times a week; first semester. Professor Woodworth, Assistant Professor Bonnett.

29. Principles of Field Plot Experimentation.—Three times a week; first semester. (Given in 1938-39 and in alternate years.) Professor Woodworth.

30. Metabolism of Soil Microorganisms.—Three times a week; second semester. (Given in alternate years; not given in 1938-39.) Associate Professor Sears.

31. Biological Methods of Soil Investigation.—Three times a week; second semester. (Given in 1938-39 and in alternate years.) Associate Professor Sears.

32. Physical Methods of Soil Investigation.—Three times a week; first semester. (Given in 1938-39 and in alternate years.) Dr. Stauffer.

33. Chemical Methods of Soil Investigation.—Three times a week; first semester. (Not given in 1938-39.) Professor DeTurk.

35. Farm Appraisals.—See Agricultural Economics 42.

ANIMAL HUSBANDRY

The department of animal husbandry offers graduate work leading to the degree of Master of Science and the degree of Doctor of Philosophy. For a major or minor for the master's degree the student may specialize in the general field of animal production, or in the special fields of animal genetics, animal nutrition, animal pathology and poultry husbandry. For a major or minor for the doctor's degree he may specialize in animal genetics, the economics of meat production, animal nutrition, and animal pathology. Advanced work in poultry husbandry may be taken for a minor for the doctor's degree.

For registration for a minor in animal husbandry a student must offer at least 15 college credits in the field, including the principles of feeding, the principles of genetics, livestock production and livestock judging, and he must have had an introductory course in organic chemistry. For a major a student must offer at least 5 additional college credits in animal husbandry or in courses related to the major field of specialization. Besides these general requirements, a student must have had the special training required for effective graduate study in the field of his chosen major: For work in animal production, the economics of meat production; for work in poultry husbandry, an introductory course in farm management; for work in animal genetics, at least an introductory course in general zoology; for work in animal nutrition, a satisfactory course in quantitative chemical analysis, and preferably also a course in animal physiology; for work in animal pathology, training in histology, physiology, bacteriology, and hygiene. Attention is also directed to the advisability of in-

cluding in undergraduate preparation for graduate work in any phase of animal husbandry at least introductory training in French or German and in mathematics.

In the case of students with an unusually thorough training in science who wish to pursue graduate work in some special field of animal husbandry from a non-agricultural viewpoint, the department may waive certain of the above requirements.

Students who desire to become candidates for the doctorate and who register for a minor in the general fields of animal production or the economics of meat production must take Animal Husbandry 7 and 41, if they have not taken these courses or their equivalents during their undergraduate training. Such students registering for a major in these general fields must take in addition Animal Husbandry 131, and most students so majoring will find it desirable to register in Animal Husbandry 35.

Courses for Graduates

103. Personnel Relationships in Teaching, Research, and Extension Work.—Organization and administration of research; objects, methods, and the sources of error in experimental work. Open to graduate students in all departments of the College of Agriculture. Once a week; second semester. *One-half unit.* (Not given in 1938-39.)

112. Research.—One to three times a week; both semesters. *One-half to two units.* May be taken on Saturday mornings by special arrangement. Investigations along the following lines:

(a) Economic Factors in Meat Production.—Professors Rusk, Carroll.

(b) Systems of Livestock Farming.—Professor Case.

(c) Animal Pathology.—Professor Graham.

(d) Animal Nutrition.—Professor Mitchell, Assistant Professor Hamilton.

(e) Animal Genetics.—Professor Roberts.

(f) Poultry Husbandry.—Professor Card.

117. Animal Genetics.—Two to three times a week; both semesters. *One unit.* Professor Roberts.

118. Animal Nutrition Seminar.—A review of current literature in animal nutrition. Two hours a week; both semesters. *One-half unit.* Professor Mitchell.

119. Laboratory Methods in Animal Nutrition.—Two to five times a week; both semesters. *One-half to one unit.* Assistant Professor Hamilton.

120. Laboratory Methods in the Diagnosis of Animal Diseases.—Two to five times a week; both semesters. *One-half to one unit.* Professor Graham.

121. Laboratory Methods in Animal Genetics.—Two to five times a week; both semesters. *One-half to one unit.* Professor Roberts.

131. Advanced Course in Animal Nutrition.—Three times a week; second semester. *One-half unit.* Professor Mitchell.

Courses for Graduates and Advanced Undergraduates

7. Principles of Animal Nutrition.—Five times a week; first semester. Assistant Professor Hamilton.

22. Advanced Stock Judging.—Five times a week; first semester. Members of the department.

24. Meat Judging and Special Problems.—Two to five times a week; first semester. Associate Professor Bull.

25. Beef Production.—Three times a week; first semester. Professor Rusk, Associate Professor Snapp.

26. Pork Production.—Three times a week; first semester. Professor Carroll.

27. Sheep Husbandry.—Three times a week; second semester. Associate Professor Kammlade.

28. History of Breeds of Livestock.—Three times a week; second semester. Professor Edmonds and other members of the department.

33. Horse Production.—Three times a week; second semester. Professor Edmonds, Mr. Crawford.

35. Animal Hygiene, Sanitation, Contagious Diseases of Farm Animals.—Twice a week; second semester. Professor Graham, Dr. Boley.

39. Poultry Breeding and Improvement.—Three times a week; first semester. Professor Card.

40. Economics of Poultry Production.—Three times a week; second semester. Professor Card.

41. Animal Genetics.—Three times a week; second semester. Professor Roberts.

43. Animal Nutrition.—Three times a week; second semester. Open to students not majoring in animal nutrition. Assistant Professor Hamilton.

ARCHITECTURE AND ARCHITECTURAL ENGINEERING

The prerequisite for graduate work in the Department of Architecture is the equivalent of the undergraduate courses required at the University of Illinois for the bachelor's degree in the department in the branches of the subjects in which registration is desired.

Courses for Graduates

101. Architectural Construction.—Theory and design. Twice a week; both semesters. *One-half to two units.* Professor Palmer.

103. Architectural Construction.—Special problems. Twice a week; both semesters. *One-half to two units.* Professor Morgan.

104. Architectural Design.—Advanced course. Twice a week; first semester. *One to three units.* Professor Deam.

105. Architectural Practice.—Research in special topics. Once a week; both semesters. *One-fourth to one-half unit.* Professor Provine.

106. Architectural History.—Special research. Twice a week; both semesters. *One-half to two units.* Professor Newcomb.

Courses for Graduates and Advanced Undergraduates

15. History of Architecture.—Medieval architecture. Twice a week; first semester. Associate Professor Van Derpool.

16. History of Architecture.—Continuation of 15. Twice a week; second semester. Associate Professor Van Derpool.

17. History of Architecture.—Renaissance. Twice a week; first semester. Associate Professor Van Derpool.

18. History of Architecture.—Modern architecture. Twice a week; second semester. Associate Professor O'Donnell.

35-36. Architectural Design (Intermediate).—Four times a week; both semesters. Assistant Professors Scheick, Love.

37-38. Architectural Design (Advanced).—Six times a week; both semesters. Professor Deam, Mr. Keith.

47. Steel Construction.—Lectures and laboratory. Five times a week; first semester. Professor Morgan.

48. Steel Construction.—Continuation of 47. Five times a week; second semester. Professor Morgan.

57. Reinforced Concrete.—Theory. Three times a week; first semester. Professor Palmer.

58. Reinforced Concrete.—Design. Continuation of 57. Three times a week; second semester. Professor Morgan.

68. Specifications.—Three times a week; both semesters. Professor Provine.

83. Office Practice.—Twice a week; first semester. Professor Provine.

ASTRONOMY

The prerequisites for graduate study in astronomy are mathematics through calculus, a year's course in descriptive astronomy, and a course in college physics.

Courses for Graduates

101. Seminar.—Three times a week; both semesters. *One unit.*

103. Celestial Mechanics.—Three times a week; both semesters. *One unit.* (Not given in 1938-39.)

Courses for Graduates and Advanced Undergraduates

7. Celestial Mechanics.—Three times a week; second semester.

14. Observational Astronomy.—Three times a week; first semester.

15. Geodetic Astronomy.—Three times a week; first semester.

BACTERIOLOGY

Students electing bacteriology as a major study must have had at least 10 semester hours of bacteriology and 15 semester hours of some other physical or biological science. Before receiving a degree a student must have had work equivalent to courses 20, 8, 26, 103, and 107; candidates for the doctor's degree will be held responsible for a general knowledge of the subject as applied to plant pathology, dairy husbandry (dairy bacteriology), and soil biology. Courses in these subjects are listed under their respective departments and will be counted, after conference with adviser, toward the requirements for the doctor's degree.

In addition to the usual examinations in courses, each candidate for the master's degree will be required to pass a general written examination toward the close of the second semester of residence.

Candidates for the doctor's degree with a major study in another field than bacteriology, who elect a first or second minor in bacteriology, must offer a minimum of three units for the first minor and two and one-half units for the second minor selected from the courses offered in this department, or, for satisfactory reasons, certain courses in the departments mentioned above. These courses must include course 103 and one advanced laboratory course in the department of bacteriology.

NOTE: The attention of students is also called to the following courses offered in other departments. Certain of them must be elected for advanced degrees after conference with adviser. Agronomy 11, 30, and 31; Animal Husbandry 35, 112, and 120; Botany 45, 79, 72, 117, 41, and 170; Dairy Husbandry 10, 106, 112, and 113; Horticulture 51 and 135; Zoology 18, 31, 118, 131, 128, and 121; Chemistry 50a, 86a, and 29b.

Courses for Graduates

103. PHYSIOLOGY OF BACTERIA.—Twice a week; first semester. *One unit.* Professor TANNER.

107. RESEARCH.—For those students who are taking a major in bacteriology either for the doctor's degree or master's degree. Both semesters. *One-half to four units.* Professor TANNER, Assistant Professor WALLACE.

118a–118b. CURRENT LITERATURE.—Required of all graduate students majoring in bacteriology. Once a week; both semesters. *One-fourth unit.* Professor TANNER.

Courses for Graduates and Advanced Undergraduates

8. FOOD AND APPLIED BACTERIOLOGY.—Water, sewage, and food bacteria. Five times a week; second semester. Professor TANNER, Dr. CLARK.

10. EPIDEMIOLOGY.—Twice a week; second semester. Assistant Professor WALLACE.

20. GENERAL BACTERIOLOGY.—For seniors and graduate students. Five times a week; first semester. Assistant Professor WALLACE.

26. PATHOGENIC BACTERIOLOGY.—Five times a week; first semester. Assistant Professor WALLACE.

BOTANY

Candidates for advanced degrees in botany must offer for admission at least 20 hours in botany inclusive of courses 2 or 12 and 3, or 15 hours in botany and 5 hours in a related subject acceptable to the department. Graduate students who elect botany for minor credit must offer 15 hours in botany, or 10 hours in botany and 5 hours in a related subject acceptable to the department.

The department wishes to call the attention of graduate students to courses in agronomy and soils, bacteriology, chemistry, entomology, geography, geology, horticulture, mathematics, physics, physiology, and zoology which are available to advanced students and offer a broad foundation for the different phases of botanical work. The practical work in plant sciences in the College of Agriculture and the Experiment Station offers unusual facilities to the graduate student. Joint majors may be arranged in botany and agronomy.

Courses for Graduates

110. BOTANICAL DISCUSSIONS.—Required of all graduate students and of members of the instructional staff. Once a week; both semesters. No credit.

112. DISCUSSIONS IN PLANT MORPHOLOGY.—Once a week; both semesters. *One-fourth unit.* Professor BUCHHOLZ.

113. DISCUSSIONS IN PLANT PHYSIOLOGY.—Once a week; both semesters. *One-fourth unit.* Assistant Professors FULLER, WYND.

117. DISCUSSIONS IN PLANT PATHOLOGY AND MYCOLOGY.—Once a week; both semesters. *One-fourth unit.* Professor STEVENS.

118. DISCUSSIONS IN PLANT ECOLOGY.—Once a week; both semesters. *One-fourth unit.* Associate Professor VESTAL.

Research Courses

120. Plant Morphology.—Once or twice a week; both semesters. *One-half to two units.* (Botany 112 to be taken concurrently.) Professor Buchholz.

130. Plant Physiology.—Once or twice a week; both semesters. *One-half to two units.* (Botany 113 to be taken concurrently.) Assistant Professors Fuller, Wynd.

170. Plant Pathology or Mycology.—Once or twice a week; both semesters. *One-half to two units.* (Botany 117 to be taken concurrently.) Professor Stevens.

180. Plant Ecology or Geography.—Once or twice a week; both semesters. *One-half to two units.* (Botany 118 to be taken concurrently.) Associate Professor Vestal.

Courses for Graduates and Advanced Undergraduates

20. Cytology.—Once or twice a week; second semester. (Given in alternate years; not given in 1938-39.) Professor Buchholz.

33. Plant Physiology.—Growth, and the effect of environment on growth. Once or twice a week; first semester. Assistant Professor Fuller.

34. Plant Physiology.—Respiration, and the effects of the environment and food on energy release. Once or twice a week; second semester. Assistant Professor Wynd.

41. Algae and Bryophytes.—Morphology and classification. Once or twice a week; second semester. Dr. Hague.

43. Pteridophytes.—Comparative morphology. Once or twice a week; first semester. (Given in 1938-39 and in alternate years.) Professor Buchholz.

44. Spermatophytes.—Comparative morphology. Once or twice a week; second semester. (Given in 1938-39 and in alternate years.) Professor Buchholz.

45. Plant Histology, Anatomy, and Technique.—Once or twice a week; first semester. Professor Buchholz, Dr. Tippo.

46. Heredity and Evolution.—The cell in inheritance, environment, adaptation, and evolution. Once or twice a week; first semester. (Given in alternate years; not given in 1938-39.) Professor Buchholz.

55. Plant Geography of North America.—Regional divisions; climate, soil, topography, vegetation, vegetational history. Once or twice a week; first semester. (Given in alternate years; not given in 1938-39.) Associate Professor Vestal.

56. Plant Geography.—Plants and vegetation of continents other than North America; geographic relations of floras. Once or twice a week; first semester. (Given in 1938-39 and in alternate years.) Associate Professor Vestal.

60. Advanced Systematic Botany.—Phylogenetic study of flowering plants. Relationship of the principal orders and families, rules of taxonomy and the identification of species. Once or twice a week; first semester. (Given in 1938-39 and in alternate years.) Assistant Professor Fuller.

72. Mycology.—Structure, classification, and identification of fungi, including those of economic importance. One or twice a week; second semester. Professor Stevens.

79. Research Methods in Plant Pathology.—Once or twice a week; first semester. Professor Stevens.

80. Ecology: Plant Environments.—Analysis of complexes of factors; correlations with plants and with vegetation. Once or twice a week;

second semester. (Given in alternate years; not given in 1938-39.) Associate Professor VESTAL.

81. PLANT ECOLOGY.—Relation to environment and distribution of individual plants and of vegetation (communities). Once or twice a week; first semester. Associate Professor VESTAL.

88. ECOLOGY: PLANT COMMUNITIES.—Characteristics, composition, and classes of vegetation-units. Once or twice a week; second semester. (Given in 1938-39 and in alternate years.) Associate Professor VESTAL.

BUSINESS ADMINISTRATION

The degree Master of Business Administration is granted to those who complete satisfactorily a course of study which is substantially a fifth year of work in departments of the College of Commerce and Business Administration. The work of such fifth year is supervised by a committee representing the courses in economics, accountancy, and business organization and operation. The degree may be conferred on candidates who have completed satisfactorily the required amount of seminar work and study, and passed a comprehensive examination in the various aspects of business administration—production, personnel, administration, control (accounting and statistics), finance, market distribution, and social responsibility.

For the present, at least, all students in this course must register for full-time graduate study, four units a semester, beginning the first semester and continuing through the second semester.

The requirements for registration in the course leading to the degree are: (1) a bachelor's degree from a recognized college of commerce, school of business, or the equivalent, and (2) a scholastic average in academic subjects substantially above the minimum requirements for that bachelor's degree.

Courses for Graduates

100. SEMINAR.—Four times a week; both semesters. *Four units.* Professors LITTLETON, RUSSELL, and other members of the staffs of the departments in the College of Commerce and Business Administration.

BUSINESS ORGANIZATION AND OPERATION
(Including Accountancy and Business Law)

ACCOUNTANCY

Accountancy may be taken as a major for the degree of Master of Scienc or Doctor of Philosophy. A student registering in accountancy as a major mus have the equivalent of 15 university credits in accountancy and also at least on course each in principles of economics and finance. One desiring to pursu accountancy as a minor must present similar courses, with 12 instead of 1 credit hours in accountancy as a minimum. Accountancy 4a is a prerequisit for 106; 3b for 110; 13 for 113; and 20 for 120.

Courses for Graduates

101. CONCEPTS AND PRINCIPLES.—Twice a week; second semester. *One unit.* Pro fessor LITTLETON.

103. INCOME DETERMINATION.—Twice a week; first semester. *One unit.* Pro fessor LITTLETON.

104. ACCOUNTING SYSTEMS.—Twice a week; both semesters. *One unit.* Pro fessor SCOVILL.

106. Cost Accounting.—Twice a week; second semester. *One unit.* Professor Schlatter.

107. Surplus and Dividends.—Twice a week; first semester. *One unit.* Professor Littleton.

109. Accounting History.—Twice a week; second semester. *One unit.* Professor Littleton.

113. Governmental Accounting.—Twice a week; first semester. *One unit.* Professor Morey.

120. Income Tax Development.—Twice a week; first semester. *One unit.* Professor Filbey.

129. Thesis.—Once a week; both semesters. *One unit.* Professor Littleton and members of the staff.

Courses for Graduates and Advanced Undergraduates

3a. Advanced Accounting.—Three times a week; either semester. Associate Professor Theiss, Assistant Professor Newcomer.

3b. Auditing.—Three times a week; either semester. Professor Filbey, Associate Professor Theiss.

4a. Cost Accounting.—Twice a week; either semester. Professor Schlatter.

4b. Accounting Systems.—Twice a week; either semester. Associate Professor Baily.

5a–5b. C.P.A. Problems.—Three times a week; both semesters. Professor Scovill.

13. Governmental Accounting.—Twice a week; either semester. Professor Morey, Assistant Professor Hackett.

20. Income Tax Procedure.—Twice a week; either semester. Professor Filbey.

30. Budgets and Accounting Control.—Three times a week; either semester. Associate Professor Theiss.

BUSINESS ORGANIZATION AND OPERATION

Work may be done in the field of business organization and operation for a major or a minor for the M.S. degree, and for a minor for the doctorate. To do major work in this field, the student must have completed an undergraduate curriculum equivalent to that of the College of Commerce and Business Administration. To do minor work, he must have had at least five semester hours' credit in the principles of economics, also Business Organization and Operation 1 and 2 or the equivalent. Business Organization and Operation 1 is a prerequisite for 104.

Courses for Graduates

102. Marketing Research and Policies.—Twice a week; both semesters. *One unit.* Professor Converse.

104. Scientific Management.—A study of modern management methods and procedures, particularly as they apply to industrial enterprises. Twice a week; both semesters. *One unit.* Professor Anderson.

107. Sales Campaigns.—Twice a week; both semesters. *One unit.* Professor Russell.

129. Seminar.—Time to be arranged; both semesters. *One unit.* Professor Russell and others.

Courses for Graduates and Advanced Undergraduates

3. Retail and Chain Store Organization and Operation.—Three times a week; either semester. Mr. Mitchell.

4. Management in Manufacturing.—Three times a week; first semester. Professor Anderson.
7. Salesmanship.—Twice a week; either semester. Assistant Professor Beach.
8. Advertising.—Three times a week; either semester. Professor Russell.
9. Trade Associations and Commercial Organizations.—Twice a week; second semester. Dean Thompson.
14. The Technique of Executive Control.—Three times a week; second semester. Professor Anderson.
17. Problems in Sales Administration.—Twice a week; either semester. Assistant Professor Beach.
18. Advertising Campaigns.—Three times a week; second semester. Professor Russell.
20. Credits and Collections.—Three times a week; either semester. Assistant Professor Huegy.
22. Marketing Research and Policies.—Twice a week; second semester. Professor Converse.
25. History of Marketing in the United States.—Three times a week; first semester. Dr. Jones.
32. Contemporary Problems in Marketing Management.—Three times a week; second semester. Professor Russell.

BUSINESS LAW

Course for Graduates and Advanced Undergraduates

10. Law of Security Relations and Banking.—Three times a week; either semester. Professor Dillavou.

CERAMIC ENGINEERING

This department offers graduate work leading to the degrees of Master of Science in Ceramics, Master of Science in Ceramic Engineering, Doctor of Philosophy in Chemistry (Ceramic Chemistry), and Doctor of Philosophy in Engineering.

The prerequisite for majoring in graduate work in ceramics or ceramic engineering is proficiency in the undergraduate courses required for the degree of Bachelor of Science in the branch of the subject in which registration is desired or substantial equivalents.

Candidates for the degree of Doctor of Philosophy in Chemistry (Ceramic Chemistry) must have had the equivalent of at least 25 semester hours of satisfactory courses in general, analytical, physical, and organic chemistry; also calculus, one year of college physics, one semester of optical mineralogy, and at least 18 semester hours or their equivalent in acceptable ceramic courses.

Courses for Graduates

101. The Chemistry of the Compounds of Silicon.—Twice a week; both semesters. *One unit.* Professor Parmelee.
102. General Technology of the Silicate Industries.—Twice a week; both semesters. *One to two units.*
    (a) Ceramic Materials and Processes.—Professor Parmelee.
    (b) Drying and Firing Processes.—Professor Hursh.
    (c) Enamels and Equilibrium Studies.—Professor Andrews.
    (d) Refractories.—Dr. Morgan.

103. Chemistry of Silicates.—Laboratory to supplement Ceramic Engineering 101, which must precede or accompany it. Both semesters. *One to two units.* Professor Parmelee.

104. Technology of Glass.—Twice a week; second semester. *One to two units.* Professor Parmelee.

105. Methods of Ceramic Research.—Twice a week; second semester. *One unit.* Professor Parmelee.

106. Research.—Professors Parmelee, Hursh, Andrews, Dr. Morgan.

Courses for Graduates and Advanced Undergraduates

5. Ceramic Bodies.—Five times a week; first semester. Professor Parmelee.

7. Structural Clay Products.—Three times a week; first semester. Professor Andrews.

8. Glass Technology.—Twice a week; second semester. Professor Parmelee.

10. Cements.—Twice a week; second semester. Professor Andrews.

11. Drying Clay Products.—Three times a week; second semester. Professor Hursh.

14. Glasses and Glazes.—Three times a week; second semester. Professor Parmelee.

16. Enamels.—Three times a week; second semester. Professor Andrews.

17. Enamels.—Three times a week; first semester. Professor Andrews.

18. Ceramic Microscopy.—Three times a week; both semesters. Dr. Morgan.

20. Refractory Materials.—Twice a week; second semester. Dr. Morgan.

22. Kilns and the Burning of Clay Products.—Three times a week; first semester. Professor Hursh.

23. Dryer and Kiln Design.—Twice a week; first semester. Professor Hursh.

24. Ceramic Engineering Design.—Three times a week; second semester. Professor Hursh.

28. Pyrochemical Problems.—Twice a week; second semester. Professor Andrews.

CHEMISTRY

(Including Chemical Engineering)

Students who enter graduate work with chemistry or chemical engineering as their major subject must present two semesters of college work in French or German (German greatly preferred to French).

Graduate students whose major subject is in some department other than chemistry, before taking graduate work for credit in this department, must have had the equivalent of 15 university credits in chemistry, and the ground covered should include satisfactory work in general chemistry and in qualitative and quantitative analysis and elementary organic chemistry. Such students are advised to make selections from the following courses: Chemistry 40, 41, 42, 43, 27, 36 and 37, 50, 60a, 15b, 16b, and 29b. Courses of a more special nature will not as a rule be accepted for graduate work unless preceded by one of the courses above. Graduate students who are candidates for an advanced degree in chemistry or chemical engineering must have had the equivalent of 25 university credits in chemistry properly distributed.

Graduate students whose major subject is in some department other than chemistry and who intend to take a first minor in chemistry or any branch of

chemistry toward the Ph.D. degree must include among the courses taken, Chemistry 40 and 41, or must have had the equivalent.

Graduate students who are candidates for the A.M. or M.S. degree in chemistry must include in the courses taken Chemistry 40 and 41 or must have had the equivalent. Graduate students who are candidates for the Ph.D. degree in any branch of chemistry or chemical engineering must include among their courses Chemistry 40, 41, 42, and 43 or must have had the equivalent.

Students who intend to take graduate work in chemistry or chemical engineering should include in their undergraduate preparation at least the equivalent of one full year of physics, one year of French, one year of German, and mathematics through differential and integral calculus. Any student without these subjects may enter the Graduate School but will be required to spend part of his time in residence on the above-mentioned subjects.

Candidates for the degree of Ph.D. in chemical engineering must have completed an undergraduate training in chemical engineering comparable to that offered in the chemical engineering curriculum at the University of Illinois.

Courses for Graduates

Inorganic Chemistry

101a–101b. Inorganic Chemistry.—The less familiar elements and their relationship in the periodic system. Lectures; recitations. Twice a week; both semesters. *One-half unit.* Professor Hopkins.

102a–102b. Inorganic Chemistry.—(Laboratory.) Inorganic preparations and qualitative analysis of the less familiar elements. To accompany or follow Chemistry 101a–101b. One to three times a week; both semesters. *One-fourth to three-fourths unit.* Professor Hopkins.

105a-105b. Inorganic Chemistry.—(Seminar.) Current literature. (Required of all students whose major is inorganic chemistry.) Once a week; both semesters. *One-fourth unit.* Professor Hopkins.

106a. Inorganic Chemistry.—Special topic: Structure of complex inorganic compounds. Twice a week; first semester. *Three-fourths unit.* Assistant Professor Bailar.

106b. Inorganic Chemistry.—Special topic: Liquid ammonia and other nonaqueous solvents as reaction media. Twice a week; second semester. *Three-fourths unit.* Assistant Professor Audrieth.

115a. Inorganic Chemistry.—The periodic relationship of the commercially important elements, their applications and compounds. Lectures, reports, recitations. *(Note:* Students who have received credit in Chemistry 15a are not allowed to take Chemistry 115a for credit.) Three times a week; first semester. *Three-fourths unit.* Dr. Reed.

116a. Synthetic Inorganic Chemistry.—(Laboratory). Advanced inorganic preparations. One to three times a week; first semester. *One-fourth to three-fourths unit.* Assistant Professor Audrieth.

Analytical Chemistry

123a. Qualitative Analysis and Microanalysis,—The principles and methods of analytical chemistry; theory of solutions. Lectures. Twice a week; first semester. *One-half unit.* Associate Professor Reedy.

123c. Qualitative Analysis and Microanalysis.—Laboratory, optional, to accompany Chemistry 123a. Special topic: Microanalysis. Twice a week; first semester. *One-half unit.* Associate Professor Reedy.

124b. Quantitative Analysis.—A modern survey of advanced principles, calculations, experimental methods and applications. Lectures. Twice a week; second semester. *One-half unit.* Associate Professor Smith.

124d. Quantitative Analysis.—Laboratory, optional, to accompany Chemistry 124b. Twice a week; second semester. *One-half unit.* Associate Professor Smith.

125a-125b. Analytical Chemistry.—(Seminar.) Special topics in analytical chemistry. (Required of all students taking a major or minor in analytical chemistry.) One to three times a week; both semesters. *One-fourth to one unit.* Professor Clark.

126a. Quantitative Instrumental and Chemical Methods of Analysis in Chemical Research.—(Ultimate bomb analysis, gas density, polarimetry, refractometry, spectrophotometry, colorimetry, microscopy, etc.) Lectures; laboratory. Three times a week; first semester. *Three-fourths unit.* Associate Professor Englis.

127a–127b. Applied X-rays.—Lectures. Twice a week; both semesters. *One-half unit.* Professor Clark.

127c–127d. Applied X-rays.—Laboratory, optional, to accompany Chemistry 127a–127b. Twice a week; both semesters. *One-half unit.* Professor Clark.

Organic Chemistry

130a. Organic Chemistry.—Survey of organic chemistry designed for first year graduate students. (*Note:* Students who have received credit in Chemistry 36 are not allowed to take Chemistry 130a for credit.) Three times a week; first semester. *Three-fourths unit.* Professor Fuson.

132b. Organic Chemistry.—Advanced survey of organic chemistry (to follow Chemistry 130a). Twice a week; second semester. *Three-fourths unit.* Professor Shriner.

133a. Organic Chemistry.—Optical isomerism, cis-trans isomerism, tautomerism, chemistry of the carbohydrates, etc. Twice a week; first semester. *Three-fourths unit.* Professor Adams.

134. Organic Chemistry.—(Laboratory.) Advanced organic synthesis. Two to four times a week; both semesters. *One-half to one unit.* Professors Fuson, Shriner.

135a–135b. Organic Chemistry.—(Seminar.) Current literature. Once a week; both semesters. *One-fourth unit.* Professor Adams.

136a. Organic Chemistry.—Lectures and laboratory work on newer methods in organic laboratory procedure. Twice a week; first semester. *Three-fourths unit.* Professor Shriner.

Physical Chemistry

144a-144b. Physical Chemistry.—Kinetic theory, statistical mechanics, molecular dynamics. Lectures. Twice a week; both semesters. *Three-fourths unit.* Dr. Wall.

145a–145b. Physical Chemistry.—(Seminar.) Recent development in physical chemistry. Twice a week; both semesters. *Three-fourths unit.* Professor Rodebush and staff.

Biochemistry

150b. Biochemistry.—Chemistry of intermediary metabolism. Lectures; discussions; readings. Twice a week; second semester. *Three-fourths unit.* Professor Rose.

152a-152b. Biochemistry.—Difficult biochemical preparations; chiefly laboratory. One to five times a week; both semesters. *One-half to one unit.* Professor Rose.

155a-155b. Biochemistry.—(Seminar.) Current literature. (Required of all graduate students whose major is biochemistry.) Twice a week; both semesters. *Three-fourths unit.* Professor Rose.

Chemical Engineering

160a. Flow of Fluids.—Lectures. Twice a week; first semester. *One-half unit.* Professor Keyes.

161a. Heat Transmission.—Lectures. Twice a week; first semester. *One-half unit.* Assistant Professor Comings.

164a. Absorption and Extraction.—Lectures. Twice a week; first semester. *One-half unit.* Associate Professor Johnstone.

165a–165b. Chemical Engineering.—(Seminar.) (Required of all graduate students majoring in chemical engineering.) Once a week; both semesters. *One-fourth unit.* Professor Keyes and staff.

166b. Filtration and Separation.—Lectures. Twice a week; second semester. *One-half unit.* Associate Professor Johnstone.

169b. Catalysis.—Lectures. Twice a week; second semester. *One-half unit.* Professor Keyes.

Sanitary Chemistry

185a-185b. Chemistry of Water Treatment.—(Seminar.) Special problems and new developments in sanitary chemistry. Once a week; both semesters. *One-fourth to one and one-fourth units.* Professor Buswell.

Miscellaneous

190a–190b. Research.—A thesis is usually required of students taking the master's degree and is always required of students taking the degree of Doctor of Philosophy. Both semesters. Work may be taken in the following subjects:

Physical and Electrochemistry.—Professors Rodebush, Phipps, Assistant Professor Copley.

Inorganic Chemistry.—Professor Hopkins, Associate Professor Reedy, Assistant Professors Audrieth, Bailar, Copley.

Analytical Chemistry.—Professor Clark, Associate Professors Reedy, Smith, Englis.

Applied X-rays.—Professor Clark.

Food Chemistry.—Associate Professor Englis.

Phytochemistry.—Associate Professor Englis.

Organic Chemistry.—Professors Adams, Marvel, Fuson, Shriner.

Water Chemistry.—Professor Buswell.

Colloid Chemistry.—Professor Buswell.

Zymochemistry.—Professor Buswell.

Biochemistry.—Professor Rose, Assistant Professor Carter.

Chemical Engineering.—Professor Keyes, Associate Professors Johnstone, Swann.

Ceramic Chemistry.—Professor Parmelee.

Non-aqueous Solvents.—Assistant Professor Audrieth.

192a. Chemical Literature and Reference Work.—Once a week; first semester. *One-fourth unit.* Dr. Bartow.

Courses for Graduates and Advanced Undergraduates

Analytical Chemistry

25b. Survey of Analytical Chemistry.—An intensive review of the fundamental principles and procedures of qualitative and quantitative analysis. Three times a week; second semester. Associate Professor Reedy.

27. Special Methods and Instruments in Quantitative Analysis.—Three times a week; both semesters. Associate Professor Smith.

29b. Food Analysis.—Quantitative organic analysis of food products; alcohols, carbohydrates, fats and oils, cereals, nitrogenous bodies, preservatives, and colors. Six times a week; second semester. Associate Professor Englis.

Organic Chemistry

36. Organic Chemistry.—(Second course.) Lectures and recitations. Three times a week; both semesters. Professors Fuson, Marvel.

37. Organic Chemistry.—(Laboratory.) Organic synthesis. To accompany Chemistry 36. Twice a week; both semesters. Professor Fuson.

38. Qualitative Organic Analysis.—Identification of pure organic compounds and mixtures. Twice a week; both semesters. Professors Shriner, Fuson.

Physical Chemistry

40. Elementary Physical Chemistry.—Three times a week; both semesters. Professors Rodebush, Phipps.

41. Elementary Physical Chemistry.—(Laboratory.) To accompany Chemistry 40. Once a week; both semesters. Professors Rodebush, Phipps, and assistants.

42. Elementary Physical Chemistry.—Three times a week; both semesters. Professor Phipps.

43. Elementary Physical Chemistry.—(Laboratory.) Once a week; both semesters. Professor Phipps and assistants.

44a. Advanced Physical Chemistry.—Thermodynamics and free energy calculations. Twice a week; first semester. Professors Rodebush, Phipps.

46b. Advanced Physical Chemistry.—Atomic structure and valence. Twice a week; second semester. Professor Rodebush.

49b. Chemistry of Colloids.—Lectures and demonstrations. Preparation and properties of colloids. Special apparatus and technique employed in colloid chemistry. Three times a week; second semester. Professor Buswell, Dr. Gore.

Biochemistry

50. Biochemistry.—Proteins, fats, and carbohydrates; tissues, digestion, intestinal putrefaction, and feces; quantitative analysis of gastric contents, blood, milk, and urine. Lectures; laboratory. Five times a week; both semesters. Professor Rose, Assistant Professor Carter, and assistants.

51b. Problems of Metabolism.—Micro-methods of blood and urine analysis, and their application. Lectures; laboratory. Three times a week; second semester. Assistant Professor Carter, and assistants.

52b. Biochemistry of Vitamins and Hormones.—Twice a week; second semester. Assistant Professor Carter.

Chemical Engineering

60a. Chemical Engineering Unit Processes.—Heat and material balances and design problems. Lectures. Three times a week; first semester. Assistant Professor Deem.

61a–61b. Principles of Chemical Engineering.—Basic principles underlying the design and operation of the chemical engineering unit operations. Lectures. Three times a week; both semesters. Assistant Professor Comings.

62a. Principles of Research and Development.—The fundamental methods used in research and development in chemical industry. Twice a week; first semester. Professor Keyes.

63b. Introduction to Chemical Engineering.—Three times a week; second semester. Assistant Professor Deem.

64b. High Pressure Reactions.—Twice a week; second semester. Assistant Professor Comings.

65b. Chemical Engineering Calculations.—Three times a week; second semester. Associate Professor Johnstone.

67b. Chemical Technology.—Modern industrial chemical processes. Three times a week; second semester. Assistant Professor Deem.

68a–68b. Unit Operations.—Laboratory. (To accompany Chemistry 61a and 61b.) Once a week; both semesters. Associate Professor Johnstone, Assistant Professors Comings, Deem.

69a–69b. Chemical Engineering Projects.—Laboratory. Development of an individual project. Once a week; both semesters. Associate Professor Johnstone, Assistant Professors Comings, Deem.

70b. Economics of Chemical Engineering.—Lectures. Twice a week; second semester. Professor Keyes.

71a. Applied Electrochemistry.—Twice a week; first semester. Associate Professor Swann.

72a. Power Plant and Boiler Water Problems.—Twice a week; first semester. Associate Professor Swann.

Water Chemistry

86a. Chemistry of Water Treatment.—Lectures, demonstrations, field trips. Methods for determining water quality. Special water requirements of industries. Chemistry of water conditioning for municipal and industrial use. By-product recovery from industrial and other wastes. Three times a week; first semester. Professor Buswell.

Miscellaneous

95a. History of Science with Particular Reference to Chemistry.—Lectures; reading. Twice a week; first semester. Dr. Bartow.

CIVIL ENGINEERING

The prerequisite for graduate work in civil engineering is the equivalent of the undergraduate course required for the degree of Bachelor of Science in civil engineering in the branches of the subject in which registration is desired.

Courses for Graduates

101. Water Supply.—Design, pumping machinery, administration, operation. Twice a week; first semester. *One unit.* Professor Babbitt.

102. Sewerage.—Sewer design, construction, maintenance, operation, and financing. Twice a week; second semester. *One unit.* Professor Babbitt.

103. Highway Engineering.—A detailed examination of all paving materials and methods of construction; experimental pavements; road improvements; soil stabilization; machinery for highway construction; city, state, and regional planning; airports; and future planning. Twice a week; first semester. *One unit.* Professor Crandell.

104. Municipal Engineering.—City finances and budgets, the work of the city manager and city engineer, zoning, play grounds and parks, street cleaning; smoke prevention, and fire prevention. Twice a week; second semester. *One unit.* Professor Crandell.

105. Reinforced Concrete Design.—Theories of action of beams, slabs and columns of reinforced concrete. Codes and specifications and their influence on design. Effect of continuity. Twice a week; first semester. *One unit.* Professor Shedd.

106. Structural Theory and Design.—General theory of continuity. Moment distribution. The column analogy. Rigid frame bridges and buildings. Fixed and continuous arches. Classification of structures from viewpoint of design. Twice a week; first semester. *One or two units.* Professor Shedd.

107. Steel Design.—Design of steel members. Codes and specifications for buildings. Riveted and welded connections. Evolution of bridge specifications. Loads and working stresses. Economic proportions. Twice a week; second semester. *One unit.* Professor Shedd.

108. Structural Theory and Design.—Statically indeterminate trusses. Continuous trusses. Steel arches. Secondary stresses. Suspension bridges. Long span roofs. Skeleton steel buildings. Twice a week; second semester. *One or two units.* Professor Shedd.

109. Public Health Engineering.—Design of water purification works and principles of sanitation. Twice a week; first semester. *One unit.* Professor Babbitt.

110. Sewage Disposal, Wastes Disposal, and General Sanitation.—Principles and design of sewage treatment and waste disposal works. Twice a week; second semester. *One unit.* Professor Babbitt.

112. Masonry Construction.—Design and construction of dams, earth embankments; retaining walls, abutments and piers, culverts, grain elevators, and bins. Three times a week; second semester. *One unit.* Professor Huntington.

113. Soil Mechanics and Foundations.—Geological considerations; sub-surface exploration; classification, properties, and tests of rock and soil; stress distribution under foundations; consolidation and settlement; percolation and seepage; spread footings; pile foundations; deep foundations; dam foundations. Three times a week; first semester. *One unit.* Assistant Professors Bauer, Newmark.

114. Analytical Study of Tests of Structural Members.—Planning tests, limitations of experimental methods, interpretation of results in terms of design practice. Twice a week; second semester. *One unit.* Professor Wilson.

120. Highway Traffic, Transport, and Safety.—The development, distribution, and characteristics of highway traffic. Traffic survey methods and analysis. Traffic laws and regulations. Traffic control methods and devices. Causes and prevention of accidents. Accident reports and analysis. Safety methods, programs, and education. Twice a week; first or second semester. *One unit.* Professor Wiley.

130. Hydrology and Flood Control.—Magnitude and frequency of flood flow of streams, minimum flow of streams and regulation of flow by storage reservoirs, intense rainfall and the development of intensity curves for use in rational run-off formula, unit-graph method of computing flood run-off, flood control and prevention by channel improvements, levees, and reservoirs. Twice a week; first or second semester. *One unit.* Professor Pickels.

131. Water Power.—Preliminary investigations, selection of site, storage requirements, structures, machinery, etc. Twice a week; second semester. *One unit.* Professor Doland.

140. Special Problems.—Individual investigations and studies of various phases of civil engineering. First or second semester. *One-half to two units.* Members of the department.

198. Thesis.—First or second semester. *One to two and one-half units.* Members of the department.

Courses for Graduates and Advanced Undergraduates

67-68. Statically Indeterminate Structures.—The elastic theory and its applications in statically indeterminate structures. Three times a week; both semesters. Professor Shedd.

THE CLASSICS

The Degree of Master of Arts in the Classics.—The major may be either Latin or Greek.

The Degree of Doctor of Philosophy in the Classics.—The degree is given in classical philology. Major work may be taken in either Latin or Greek, but whichever language is taken as a major, the other must be taken as a first minor.

GREEK

Preparation for first-year graduate work in Greek should include at least two years of preparatory Greek, two years of college Greek, and two years of college Latin. A reading knowledge of French and German is important for candidates in this subject. The study of history and philosophy is especially recommended.

Courses for Graduates

105b. Plato.—Twice a week; first semester. *One unit.* Professor Oldfather.

110. Bibliography and Criticism.—(Thesis course; the same as Latin 110.) Once a week; both semesters. *One unit.* Professors Oldfather, Canter, Associate Professor Perry.

121. Thucydides.—Twice a week; second semester. *One unit.* Associate Professor Perry.

Courses for Graduates and Advanced Undergraduates

5. Herodotus and the Lyric Poets.—Three times a week; first semester. Associate Professor Perry.

7. Greek Drama: Tragedy and Comedy.—Three times a week; second semester. Associate Professor Perry.

18. Greek Archaeology.—Twice a week; first semester. Associate Professor Perry.

56. Greek History.—Three times a week; first semester. Professor Oldfather.

LATIN

Preparation for first-year graduate work in Latin should include at least two years of preparatory Latin and four years of college Latin. A reading knowledge of French and German is important. Some acquaintance with Greek is highly desirable, and the study of history and philosophy is especially recommended.

Courses for Graduates

104. Latin Palaeography.—Twice a week; first semester. *One unit.* Professor Oldfather.

106. Terence.—Twice a week; second semester. *One unit.* Professor Oldfather.

107. Latin Epigraphy.—Twice a week; second semester. *One unit.* Professor Canter.

110. Bibliography and Criticism.—(Thesis course; the same as Greek 110.) Once a week; both semesters. *One unit.* Professors Oldfather, Canter, Associate Professor Perry.

16. Latin Satire.—Twice a week; first semester. *One unit.* Professor Canter.

Courses for Graduates and Advanced Undergraduates

10. Latin Composition.—Twice a week; second semester. Associate Professor Perry.

18. Roman Archaeology.—Twice a week; second semester. Associate Professor Perry.

23. Livy, Tibullus, and Propertius.—Three times a week; first semester. Professor Canter.

24. Ovid (*Elegy*) and Seneca (*Epistles* and *Tragedies*).—Three times a week; second semester. Professor Canter.

56. Roman History.—Three times a week; second semester. Professor Oldfather.

DAIRY HUSBANDRY

A graduate student may elect dairy husbandry as his major subject for the degree of Master of Science or Doctor of Philosophy.

For either degree a first minor must be taken outside the department, preferably outside the college. If a second minor is elected it may with proper approval be chosen in the department.

Candidates for advanced degrees in dairy husbandry must have had adequate training in collegiate courses in dairy husbandry. In addition, depending upon his field of specialization, the student should have had courses in the following subjects: chemistry, bacteriology, physics, economics, zoology, genetics, and mathematics.

Courses for Graduates

(Research and courses in assigned problems may be taken on Saturday mornings.)

101. Economic Milk Production.—Twice a week; both semesters. *One-half to two units.* Professor Yapp.

105. Dairy Manufactures.—Both semesters. *One-half to two units.* Professors Ruehe, Tracy.

106. Dairy Bacteriology.—Research on assigned problems. Both semesters. *One-half to two units.* Professor Prucha.

107. Dairy Chemistry.—Assigned problems. Both semesters. *One-half to two units.* Associate Professor Overman.

108. Physiology of Lactation.—Both semesters. *One-half to two units.* Professor Gaines.

112. Research.—Graduate students writing theses should so indicate in registering in Dairy Husbandry 112. Both semesters. *One to four units.* Special problems along the following lines:

(a) Dairy Bacteriology.—Professor Prucha.

(b) Dairy Chemistry.—Associate Professor Overman.

(c) Dairy Cattle Breeding.—Professor Yapp.

(d) Dairy Cattle Feeding.—Professor Nevens.

(e) Milk Production.—Professor Gaines.

(f) Dairy Manufactures.—Professors Ruehe, Tracy.

113. Seminar.—Current literature in dairy bacteriology, dairy chemistry and dairy manufactures. Once a week; both semesters. *One-half unit.* Members of the Graduate Staff.

114. Seminar.—Current literature relating to various phases of milk production. Once a week; both semesters. *One-half unit.* Professors Gaines, Yapp, Nevens.

Courses for Graduates and Advanced Undergraduates

5. Composition of Dairy Products.—Three times a week; second semester. Associate Professor Overman.

10. Advanced Dairy Bacteriology.—Three times a week; first semester. Professor Prucha, Assistant Professor Brannon.

17. Advanced Study of Dairy Breeds.—Three times a week; first semester. Professor Yapp.

20. Economic Problems in Dairy Farming.—Three times a week; first semester. (Not given in 1938-39.)

21. Systems of Dairy Farming.—Three times a week; second semester. (Not given in 1938-39.)

25. Advanced Dairy Cattle Feeding.—Twice a week; first semester. Professor Nevens.

30. Advanced Dairy Manufactures.—Three times a week; second semester. Professor Tracy.

31. Advanced Dairy Manufactures.—Three times a week; first semester. Professor Ruehe, Dr. Tuckey.

32. Plant Management.—Three times a week; first semester. Professor Tracy.

ECONOMICS

Every student entering on major graduate work in economics must have had a course in the principles of the science and also in some special part of the field such as public finance or money and banking. The work must represent at least eight semester hours. He must have had at least one semester's work in English, American, or general European history, and at least three hours in political science.

Those who take the subject as a minor must have had a course of at least five semester hours in the principles alone, or in the principles and some other course for which this is a prerequisite.

Graduate students who are making economics their major are required during their first year to acquaint themselves with the works of the masters in the science, by taking either course 101 or 103. In the same or subsequent year they are expected to elect the fundamental courses in some other divisions of the field of economics. One of the minors for the doctor's degree may be taken in a separate division of economics; the other must be taken out of the department, and preferably outside of the College of Commerce.

The following courses may be taken by students in general economics for major or minor credit; all numbered above 100; 4, 5, 10, 11, 15, 19, 20, 23, 24, 25, 29, 30, 31, 41, 42, 43, 44, 51, 52, 55, 61, 65, 71, 72, 81, 92, 94, 99. The following may be taken for minor credit only: 6, 8, 9, 36, 56, 82, 83, 93, 95, 96.

Two units will be accepted for a first minor for the master's degree; and four two- or three-hour graduate courses, or their equivalent in advanced undergraduate courses, for a first minor for the doctor's degree.

Courses in agricultural economics, accountancy, and business organization and operation may be used to satisfy the requirements for the minor. See Business Organization and Operation, and Agricultural Economics.

Courses for Graduates

101. Economic Theory.—Planned primarily for first-year graduate students and particularly for those who have had only the minimum preparation required for graduate study in economics. Twice a week; both semesters. *One unit.* Assistant Professor Blodgett.

102. Monetary Theory and History from the Restriction Period to the Present.—Twice a week; both semesters. *One unit.* Professor Wright.

103. The Distribution of Wealth.—Theories of value, rent, wages, interest, and profits, and the relations between wealth and welfare. Twice a week; both semesters. *One unit.* Assistant Professor Whittaker.

104a. Theories and Policies of International Trade.—Twice a week; first semester. *One unit.* Professor Litman.

104b. Organization of International Trade.—Twice a week; second semester. *One unit.* Professor Litman.

105. Public Finance.—Twice a week; both semesters. *One unit.* Professor Hunter.

106. International Exchange and the Money Markets.—Twice a week; second semester. *One unit.* (Not given in 1938-39.)

107. The Corporation in Economic Evolution.—Twice a week; both semesters. *One unit.* (Not given in 1938-39.) Associate Professor Brown.

109. Comparison of the Theory and Practice of the Leading Central and Reserve Banks with Special Reference to England, Germany, France, and the United States.—Twice a week; first semester. *One unit.* (Not given in 1938-39.)

110. Corporation Finance and Investments.—Twice a week; both semesters. *One unit.* Associate Professor Brown.

112. Labor Problems.—Twice a week; both semesters. *One unit.* (Not given in 1938-39.)

118. Seminar.—Thesis course. (All graduate students writing theses in economics must register in Economics 118; registration for other students is optional.)
(a) Third Year: Seminar.—Professor Litman.
(b) First Year: General Economics.—Associate Professor Brown.
(d) First Year: Public Utilities.—Associate Professor Gray.

120. History of Economic Thought.—Twice a week; both semesters. *One unit.* Assistant Professor Whittaker.

122. Economic History of the United States.—Twice a week; both semesters. *One unit.* Dean Thompson.

123. Industrial and Financial Organization of Society.—Twice a week; both semesters. *One unit.* Professor Lee.

124. International Economics and Finance.—Twice a week; both semesters. *One unit.* (Not given in 1938-39.)

140. Capitalism, Socialism, Fascism, and Communism.—Twice a week; second semester. *One unit.* Dr. Helbing.

143. The Administration of Industrial Relations.—Twice a week; first semester. *One unit.* Dr. Helbing.

144. Economic Statistics with Special Reference to Time Series and Business Cycles.—Twice a week; both semesters. *One unit.* Assistant Professor Dickinson.

180. Management of Public Utilities.—Twice a week; both semesters. *One unit.* Associate Professor Gray.

192. Economics of Transportation.—Twice a week; both semesters. *One unit* Associate Professor Locklin.

See also Mathematics 129.—Theory of Statistics.

Courses for Graduates and Advanced Undergraduates

4. History of Money, Credit, and Banking Institutions, with Particular Reference to the United States.—Three times a week; second semester.

5. History and Theory of Money, Credit, and Banking Institutions with Particular Reference to the United States.—Twice a week; second semester.

6. Principles and Practices of Investment Banking.—Three times a week; first semester. Professor Lee.

8. Foreign Exchange and the Money Market.—Three times a week; second semester.

9. Advanced Theory and Practice of Banking.—Three times a week; first semester. Professor Lee.

10. Corporation Finance and Management.—Three times a week; either semester. Associate Professor Gray and others.

11. Industrial Consolidation. — Development; plans for controlling trusts. Three times a week; first semester. Associate Professor Brown.

19. Economic Development of the United States (1820-1860).—Twice a week; first semester. Dean Thompson.

20. Economic Development of the United States since 1860.—Twice a week; second semester. Dean Thompson.

23. Economic Problems.—Three times a week; first semester. Professor Lee.

24. Economic Development of Modern Europe.—Three times a week; second semester.

25. Economic History of England.—Three times a week; first semester. Assistant Professor Whittaker.

29. International Commerce and Commercial Policies.—Three times a week; second semester. Professor Litman.

30. World Markets.—Three times a week; second semester. Professor Litman.

31. Organization of International Commerce.—Three times a week; first semester. Professor Litman.

36. Investments.—Three times a week; second semester. Associate Professor Brown.

41. Labor Problems.—Three times a week; first semester.

42. Trade Unionism.—Three times a week; second semester.

43. Personnel Administration.—Three times a week; second semester. Dr. Helbing.

44. Socialism and Economic Reform.—Three times a week; either semester. Dr. Helbing.

51. Public Finance.—Three times a week; either semester. Professor Hunter.

52. State and Local Finances of Illinois.—Three times a week; second semester. Assistant Professor Allen.

55. Economics of Insurance (Life).—Three times a week; first semester. Assistant Professor Dickinson.

56. Economics of Insurance (Property).—Three times a week; second semester. Assistant Professor Dickinson.

58. Urban Land Economics.—Three times a week; first semester. (Not given in 1938-39.) Assistant Professor Dickinson.

61. Economic Theory.—Three times a week; both semesters.

65. Social Control of Business.—Twice a week; first semester. Associate Professor Gray.

71. Economic Statistics.—Three times a week; first semester. Assistant Professor Neiswanger.

72. Economic Statistics (Business Barometers).—Three times a week; second semester. Assistant Professor Neiswanger.

81. Principles of Public Utilities.—Three times a week; first semester. Associate Professor Gray.

82. Regulation of Public Utilities.—Twice a week; second semester. Professor Dillavou.

*83. Public Utility Rates.—Three times a week; second semester. Associate Professor Gray.

93. Industrial Traffic Management.—Three times a week; second semester. Associate Professor Locklin.

94. Ocean Shipping.—Three times a week; first semester. Professor Litman.

95. Railroad Rates.—Three times a week; first semester. Associate Professor Locklin.

96. Transportation Problems.—Three times a week; second semester. Associate Professor Locklin.

97. Railroad Finance.—Three times a week; second semester. (Not given in 1938-39.) Associate Professor Locklin.

98. Railroad Organization.—Twice a week; first semester. (Not given in 1938-39.) Associate Professor Locklin.

99. Current Economic Problems.—Twice a week; first semester. Dean Thompson.

EDUCATION

In addition to complying with the general rules of the Graduate School, candidates for the master's degree in education must meet the following requirements: (1) Education 125 is a required course for all students; (2) for students who have not taken a course in the history of education, Education 11 or Education 30 is required; (3) Education 6 and 25, or their equivalents, are prerequisites for all graduate courses.

No student is recommended to the Dean of the Graduate School for formal admission to candidacy for the master's degree until at least four units of the eight ordinarily required for the degree have been completed satisfactorily. In the case of a student who has been allowed to waive the thesis (see page 13) two papers will be required. The first shall be written during the first half of the student's residence and shall be an important factor in determining his further status in the department. The second shall be written during the second half of the student's period of residence.

Courses for Graduates

101. Philosophy of Education.—Once a week; two hours; second semester. *One unit.* Professor Cameron.

102. Research in History of American Education.—Arrange; both semesters. *One unit.* Professor Seybolt.

104. Educational Administration.—Once a week; two hours; both semesters. *One unit.* Associate Professor Weber.

105. Elementary School Organization and Administration.—Once a week; two hours; second semester. Professor Reeder.

106. Organization and Administration of Secondary Education.—Once a week; two hours; first semester. *One unit.* Professor Clement.

110. Recent Research in the Teaching of High School Subjects.—Once a week; two hours; both semesters. *One unit.* Professor Monroe.

119. Trends and Techniques in Curriculum Making.—Once a week; two hours; both semesters. *One unit.* Associate Professor Smith.

120. Seminar in the Supervision of Secondary Education.—Once a week; two hours; second semester. *One unit.* Professor Clement.

121. Educational Measurements.—Once a week; two hours; second semester. *One unit.* Associate Professor Odell.

123. Educational Statistics.—Once a week; two hours; first semester. *One unit.* (Not given in 1938-39.) Associate Professor Odell.

124. Techniques in Educational Research.—Once a week; two hours; both semesters. *One unit.* Professor Monroe.

125. Advanced Educational Psychology.—Once a week; two hours; both semesters. *One unit.* Professor Cameron.

128. Junior High School.—Once a week; two hours; first semester. *One unit.* (Not given in 1938-39.) Professor Clement.

129. The Junior College.—Once a week; two hours; second semester. *One unit.* (Not given in 1938-39.) Professor Clement.

131. Study of Textbooks and Other Materials of Instruction in Secondary Schools.—Once a week; two hours; second semester. *One unit.* Professor Clement.

132. Diagnostic and Remedial Work in Arithmetic.—Once a week; first semester. *One unit.* (Not given in 1938-39.)

133. Problems of Instruction and Supervision in Secondary Education.—For interns only. Once a week; first semester. *One unit.* Professor Clement, Assistant Professor Sanford.

134. The Teaching and Supervision of Reading and the Language Arts in the Elementary School.—Once a week; first semester. *One unit.* Professor Reeder.

135. The Teaching and Supervision of the Social Studies in the Elementary School.—Once a week; first semester. *One unit.* Professor Reeder.

136. Diagnostic and Remedial Work in Reading.—Once a week; two hours; second semester. *One unit.* (Not given in 1938-39.)

139. Seminar in Curriculum Problems.—Once a week; two hours; second semester. *One unit.* Associate Professor Smith.

148. Psychology of the Secondary School Subjects.—Once a week; two hours; first semester. *One unit.* Professor Cameron.

150. Thesis.—Both semesters. *One or two units.* Dean Benner and others.

170. Public School Finance and Business Administration.—Once a week; two hours; first semester. *One unit.* Associate Professor Weber.

180. Seminar in Elementary Education.—Once a week; two hours; second semester. *One unit.* Professor Reeder.

184. Seminar in School Administration.—Once a week; two hours; second semester. *One unit.* Associate Professor Weber.

185. Seminar in Educational Psychology.—Arrange; both semesters. *One unit.* Professors Cameron, Griffith.

186. Seminar in Secondary Education.—Once a week; two hours; both semesters. *One-half unit.* Professor Clement.

187. Seminar in Industrial Education.—Once a week; two hours; first semester. *One unit.* Professor Mays.

189. Administration and Supervision of Industrial Education.—Once a week; two hours; second semester. *One unit.* Professor Mays.

190. Research in Education.—Arrange; both semesters. *One unit.* Dean Benner and others.

Courses for Graduates and Advanced Undergraduates

11. Ancient and Medieval Education.—Twice a week; first semester. Professor Seybolt.

18. Educational Measurements.—Three times a week; both semesters. Associate Professor Odell.

21. Supervision of Elementary Education.—Three times a week; first semester. Assistant Professor Browne.

30. History of American Education.—Twice a week; second semester. Professor Seybolt.

31. Introduction to Modern Theories in Education.—Three times a week; second semester. Assistant Professor Browne.

41. Principles of Vocational Education.—Three times a week; second semester. Professor Mays.

42. Special Education (Superior and Handicapped Children).—Once a week; second semester. Assistant Professor Dolch.

43. Mental Tests.—Three times a week; second semester. Assistant Professor Potthoff.

45. Genetic Psychology for Teachers.—Three times a week; first semester. Professor Griffith.

46. Recent Developments in the Teaching of Elementary School Subjects.—Once a week; first semester. Assistant Professor Dolch.

52. Part-Time and Evening Schools.—Three times a week; first semester. Professor Mays.

53. Problems of Industrial Education.—Three times a week; first semester. Professor Mays.

55. Problems of Vocational Guidance.—Three times a week; second semester. Professor Mays.

ELECTRICAL ENGINEERING

The prerequisite for graduate work in electrical engineering is the equivalent of the undergraduate courses required for the degree of Bachelor of Science in electrical engineering in the branches of the subject in which registration is desired. Graduate students who wish to take a minor in electrical engineering must have had differential and integral calculus, and one year's work in college physics. Courses offered to junior and senior students in electrical engineering are open for minor credit to students majoring in other departments who have the proper prerequisites.

Courses for Graduates

101. Advanced Courses in Alternating Currents.—Both semesters. *One-half to two units:*
   (a) Graduate Seminar.—Professor Paine.
   (b) Circuit Transients.—Professor Knight.
   (c) Machine Transients.—Associate Professor Keener.
   (d) Symmerical Components.—Associate Professor Kraehenbuehl, Assistant Professor Faucett.

102. Electric Waves, Oscillations, and Transients.—Both semesters. *One-half to two units:*
(a) Theory of Electric Waves, Oscillations, and Transients.—Associate Professor Reich.
(b) Demonstration Lectures.—Associate Professor Reich.
(c) Theory of Energy Radiation.—Associate Professor Brown.
(d) Principles of Television Engineering.—Associate Professor Brown.

103. Electrical Design.—Both semesters. *One to three units:*
(a) Power Plant Design.—Professor Paine.
(b) Machine Design.—Professor Paine.
(c) Illumination Practice and Design.—Associate Professor Kraehenbuehl.

104. Vacuum Tubes and Electronic Control.—Both semesters. *One unit:*
(a) Theoretical Electronics.—Associate Professor Reich.
(b) Vacuum Tubes and Amplifiers.—Associate Professor Reich.
(c) Photoelectric Cells, Gaseous Control Tubes, and Inverters.—Associate Professor Reich.

105. Electrical Engineering Research.—Both semesters. *One to three units.* Professors Paine, Tykociner, Knight; Associate Professors Reich, Brown, Keener, Kraehenbuehl; Assistant Professor Faucett.

ENGLISH LANGUAGE AND LITERATURE

Students who enter on graduate work with English as their major subject are required to give evidence of their ability to write good English. They must present the equivalent of fourteen hours of undergraduate work in English literature, the required college work in rhetoric, and the equivalent of four semesters of college work in Latin, or in Greek, or in French, or in German. After the first year of graduate work a knowledge of French and German is indispensable.

Students making English their minor may be admitted to such courses as in the judgment of the instructor in charge they are qualified to pursue.

The Degree of Master of Arts in English.—In addition to complying with the general rules of the Graduate School, candidates for the degree of Master of Arts in English must comply with the following rules of the Department of English: (1) They must choose most of their work from the group of courses described as "for graduates," and (2) must pass a general examination.

The Degree of Doctor of Philosophy in English.—Candidates for the degree of Doctor of Philosophy in English may expect to be examined on the entire field of the English language and literature. They are urged, furthermore, to acquaint themselves as fully as possible with the history and philosophy of the period in which their main interest lies, and with the foreign languages and literature most closely related to English and that period.

Courses for Graduates

101. Research in Special Topics.—*One to two units.* Professors Hillebrand, Bernbaum, Flom, Paul, Graham, Jones, Jefferson, Fletcher; Associate Professors Parry, Parrish, Secord, Landis; Assistant Professors Rinaker, Herrick.

110. Old English (Anglo-Saxon) Poetry.—Twice a week; first semester. *One unit.* (Not given in 1938-39.) Professor Flom.

111. Seminar in Caedmon and Cynewulf.—Twice a week; first semester. *One unit.* Professor Jones.

120. History and Principles of Literary Criticism.—Twice a week; both semesters. *One unit.* (Not given in 1938-39.)

128. Literature of the Sixteenth Century.—Twice a week; both semesters. *One unit.* (Not given in 1938-39.) Professor Jones.

129. English Literature from the Norman Conquest to 1400.—Twice a week; both semesters. *One unit.* Professor Jones.

130. Tragedy.—Twice a week; ordinarily both semesters. *One unit.* (Not given in the first semester of 1938-39.) Professor Hillebrand.

135. Problems in American Literature.—Twice a week; both semesters. *One unit.* Professor Paul.

138. The Romantic Movement.—Twice a week; both semesters. *One unit.* Professor Bernbaum.

140. Investigations in Modern English Literature.—(For second-year and third-year graduate students who are preparing theses for the doctor's degree.) Once a week; three hours; both semesters. *One to three units.* (May be taken in successive years.) Professor Bernbaum.

141. Literature of the Seventeenth Century.—Twice a week; both semesters. *One unit.* Professor Fletcher.

143. Seminar in the History and Theory of Prose Fiction.—Once a week; two hours; both semesters. *One unit.* Professor Bernbaum.

145. Studies in Eighteenth Century Literature.—Once a week; two hours; both semesters. *One unit.* Professor Graham.

146. Seminar in Milton.—Once a week; two hours; both semesters. *One unit.* Professor Fletcher.

147. Shakespeare and Elizabethan Drama.—Critical study of the chief plays. Twice a week; both semesters. (Not given in 1938-39.) *One unit.* Professor T. W. Baldwin.

148. Seminar in Elizabethan Drama.—Twice a week; first semester. *One unit.* (Not given in 1938-39.) Professor T. W. Baldwin.

149. Development of Tudor Drama.—Twice a week; both semesters. *One unit.* (Not given in 1938-39.) Professor T. W. Baldwin.

151. Studies in the History of the Eighteenth Century Novel.—Three times a week; first semester. *One unit.* Associate Professor Secord.

153. Seminar in Restoration Drama.—Once a week; two hours; first semester. *One unit.* (Not given in 1938-39.) Professor Hillebrand.

157. Seminar in Spenser.—Twice a week; first semester. *One unit.* (Not given in 1938-39.) Professor Jones.

Courses for Graduates and Advanced Undergraduates

3. Poetry of Milton.—Three times a week; second semester. Professor Fletcher.

8. Old English (Anglo-Saxon).—Three times a week; first semester. Professor Flom.

9. Old English (Anglo-Saxon).—Beowulf. Three times a week; second semester. Professor Jones.

17. History of the English Language.—Three times a week; second semester. Professor Flom.

25. Chaucer.—Three times a week; first semester. Professor Jones.

26. Spenser.—Three times a week; second semester. Professor Jones.

34. Dr. Johnson and His Circle.—Three times a week; first semester. Assistant Professor Rinaker.

35. The English Drama (Previous to Shakespeare).—Three times a week; first semester. (Not given in 1938-39.) Professor T. W. Baldwin.

36. The English Drama (Exclusive of Shakespeare) from 1600 to 1700.—Three times a week; second semester. Professor Hillebrand.

38. Development of Arthurian Romance.—Three times a week; second semester. Associate Professor Parry.

54a–54b. Introduction to Comparative Literature.—Three times a week; both semesters. Professors Oldfather, Aron, Carnahan, Van Horne; Associate Professors Parry, Hamilton, Landis; Dr. Busey.

55a–55b. Survey of English Literature.—Three times a week; both semesters. Associate Professor Parry, Assistant Professor Herrick.

SPEECH

Courses for Graduates

121. History of Rhetorical Theory.—Twice a week; both semesters. *One unit.* Associate Professor Parrish.

Courses for Graduates and Advanced Undergraduates

14. Methods of Speech Correction.—Three times a week; both semesters. Dr. Nelson.

17. Advanced Interpretation.—Three times a week; second semester. Associate Professor Parrish.

18. Pronunciation.—Methods of voice improvement; the sounds of English studied by means of the International Phonetic Alphabet. Three times a week; first semester. Associate Professor Parrish.

19. Speech Science.—Principles of physics involved in the production of speech sounds. Three times a week; first semester. Assistant Professor Windesheim.

20. Speech Science.—Physiology and psychology of human speech. Three times a week; second semester. Assistant Professor Windesheim.

SCANDINAVIAN LANGUAGES

Preparation for major graduate work in the Scandinavian languages or literature must include a good knowledge of one of the Scandinavian languages and systematic work in the undergraduate courses in Scandinavian. Any graduate student in language may, however, be admitted to course 101.

Courses for Graduates

101. Old Norse.—Introduction to the language; grammar; reading of the Prose Edda in part, and selections from the sagas. Twice a week; both semesters. *One unit.* Professor Flom.

102. Old Danish.—Introduction to the language; study of texts. Twice a week; first semester. *One unit.* (Not given in 1938-39.) Professor Flom.

103. Old Swedish.—Introduction to the language; study of texts. Twice a week; second semester. *One unit.* Professor Flom.

110. Old Norse Poetry (Advanced Old Norse).—Critical study of the *Poetic Edda.* Twice a week; either semester. *One unit.* Professor Flom.

130. The Runic Inscriptions: Old Scandinavian, Anglo-Saxon, Gothic, and German.—Twice a week; second semester. *One unit.* (Not given in 1938-39.) Professor Flom.

150. Research.—Thesis; special problems in Scandinavian philology and modern Scandinavian literature. Once a week; both semesters. *One-half to two units.* Professor Flom.

ENTOMOLOGY

The prerequisite for graduate work in entomology is two years of undergraduate biology, including zoology and entomology. Entrance on major work in entomology requires at least six hours of entomology. A reading knowledge of French and German is desirable by the beginning of the second year.

Courses for Graduates

100. Research.—Once or twice a week; both semesters. *One-half to four units.*
   (a) Morphology and Embryology of Insects.—Associate Professor Hayes.
   (b) Economic Entomology.—Professor Metcalf.
   (c) Systematic Entomology.—Professor Metcalf, Assistant Professor Balduf.
   (d) Biology and Ecology of Insects.—Professor Metcalf, Assistant Professor Balduf.

107. Insect Anatomy.—Lectures and laboratory. Three times a week; both semesters. *One unit.* (Given in 1938-39 and in alternate years.) Associate Professor Hayes.

Courses for Graduates and Advanced Undergraduates

6. Special Problems.—Once or twice a week; both semesters. Various instructors.

8c. Pests of Man and Domestic Animals.—Lectures and laboratory. Three times a week; second semester. (Given in alternate years; not given in 1938-39.) Professor Metcalf.

10. Morphology and Taxonomy of Immature Insects.—Lectures and laboratory. Three times a week; both semesters. (Given in alternate years; not given in 1938-39.) Associate Professor Hayes.

20. Insect Control.—Lectures and laboratory. Three times a week; first semester. Professor Metcalf.

21. Insect Bionomics.—Lectures and readings. Three times a week; second semester. (Given in 1938-39 and in alternate years.) Professor Metcalf.

GENETICS

Those desiring a general training in genetics may take a major or minor in botany or zoology. Those desiring to approach agricultural problems through genetics may take a major or minor in agronomy, horticulture, or animal husbandry. For courses in the subject see departments of Agronomy, Animal Husbandry, Botany, Horticulture, and Zoology.

GEOLOGY AND GEOGRAPHY

For graduate work in geology the student must usually have had at least a major in geology and an acceptable field training. The following undergraduate courses are recommended: Geology 2, 20, 9, 16, 15, 24, 33, and 49. Graduate students in other departments may nevertheless be admitted to certain graduate courses in geology. A major consists of 20 hours in geology, exclusive of Geology 1, 1a, 43, and 44, and inclusive of at least five hours of courses not open to freshmen or sophomores.

For graduate work in geography the student must have had at least the equivalent of a major in geography. A major consists of 20 hours in geography, exclusive of Geography 1, and inclusive of at least five hours of courses not open to freshmen.

GEOLOGY

Courses for Graduates

101. Advanced Crystallography.—The forms and physical properties of crystallized bodies. Optical properties. Projections and measurements in preparation for x-ray, chemical, ceramic, and geological research. Twice a week; both semesters. *One unit.* Professor Quirke.

102. Igneous Petrography.—Lectures; laboratory. Twice a week; both semesters. *One unit.* (Given in alternate years; not given in 1938-39.) Professor Quirke.

122. Mountain and Continental Structures.—A study of the structure and dynamics of mountain ranges and of other areas having interesting structural problems. Three times a week; second semester. *One unit.* (Given in alternate years; not given in 1938-39.) Associate Professor Shepard.

125. Sedimentation.—The interpretation of sedimentary rocks in terms of their origin. Three times a week; first semester. *One unit.* (Given in alternate years; not given in 1938-39.) Associate Professor Wanless.

126. Sedimentary Petrology.—Description of sedimentary rocks and cuttings; various methods of analysis of sedimentary rocks and interpretation of results. Two or three times a week; second semester. *One unit.* (Given in alternate years; not given in 1938-39.) Associate Professor Wanless.

134. Advanced Studies in Geology.—Studies in metamorphism, pre-Cambrian geology, ore deposition, advanced paleontology, geophysical prospecting, and other subjects, to be arranged with members of the department. *One-half to four units.*

135. Research.—Once a week; both semesters. *One-half to four units.* Members of the department.

142. Stratigraphic Paleontology: Paleozoic.—The invertebrate index fossils of the successive geologic formations. Three times a week; first semester. *One unit.* Associate Professor Sutton.

143. Stratigraphic Paleontology: Mesozoic and Cenozoic.—Stratigraphic study of the formations with a consideration of characteristic fossils. Three times a week; second semester. *One unit.* Associate Professor Sutton.

145. Micropaleontology.—Classification of microorganisms: foraminifera, ostracodes, conodonts, scolecodonts, and other major groups. Stratigraphic correlation. Three times a week; both semesters. *One unit.* (Given in 1938-39 and in alternate years.) Dr. Scott.

151. Advanced Dynamic Geology.—A critical analysis of geologic processes and their results; the materials and structure of the earth; problems of geologic interpretations. Three times a week; second semester. *One unit.* (Given in 1938-39 and in alternate years.) Associate Professor Shepard.

152. Advanced Historical Geology.—Cosmogeny; the record of diastrophism; the development of the continents and oceans; the relationship between oceanic fluctuations and organic differentiation and evolution; physiographic, climatic, and organic history. Three times a week; first semester. *One unit.* (Given in alternate years; not given in 1938-39.) Associate Professor Sutton.

160. Petroleum Geology.—Three times a week; both semesters. *One unit.* (Given in 1938-39 and in alternate years.) Professor De Wolf.

Courses for Graduates and Advanced Undergraduates

9. Invertebrate Paleontology.—Fossil groups in biological sequence. Three times a week; first semester. Associate Professor Sutton.

15. Structural Geology.—Rock deformation and its results. Three times a week; second semester.

16. Stratigraphy.—Fossil faunas, with special reference to Paleozoic invertebrates, correlation, and stratigraphy. Three times a week; second semester. Associate Professor Sutton.

24. Field Methods and Mapping.—Once a week and three or four one-day field trips and one longer field trip; second semester. (Given in alternate years; not given in 1938-39.) Associate Professor Wanless.

33. Geologic Maps.—Studies of geologic and topographic maps with reference to interpretations of stratigraphy, structure, and history. Three times a week; first semester. (Given in alternate years; not given in 1938-39.) Associate Professor Wanless.

49. Microscopic Mineralogy.—Five times a week; second semester. Dr. Chapman.

60a–60b. Introduction to Research.—Two or four times a week; both semesters. Members of the department.

61a-61b. Applied Petroleum Geology.—Primarily for students in the College of Engineering. Three times a week; both semesters. Professor De Wolf.

95. Economic Geology.—The nature, occurrence, origin, and uses of coal, oil, building stones, and bedded deposits of economic importance. Three times a week; first semester. (Given in alternate years; not given in 1938-39.) Professor De Wolf.

96. Economic Geology.—The nature, occurrence, and origin of metalliferous deposits; theories of ore deposition. Three times a week; second semester. (Given in alternate years; not given in 1938-39.) Professor Quirke.

GEOGRAPHY

Courses for Graduates

134. Advanced Studies in Geography.—Studies in geographical subjects. *One-half to four units.* Professor Blanchard, Assistant Professor Page.

135. Research.—Once a week; both semesters. *One-half to four units.* Professor Blanchard, Assistant Professor Page.

Courses for Graduates and Advanced Undergraduates

8. Geography of Europe.—Three times a week; first semester. Professor Blanchard.

10. Geography of Africa.—Three times a week; second semester. (Given in 1938-39 and in alternate years.)

11. Geography of Asia.—Three times a week; second semester. (Given in alternate years; not given in 1938-39.) Dr. Booth.

14a. Climate of the Continents.—Three times a week; second semester. (Given in 1938-39 and in alternate years.) Assistant Professor Page.

53. Production of the Great World Staples.—Three times a week; second semester. (Given in alternate years; not given in 1938-39.) Professor Blanchard.

54. Advanced Commercial Geography.—Three times a week; second semester. (Given in 1938-39 and in alternate years.) Professor Blanchard.

60a–60b. Introduction to Research.—Two or four times a week; both semesters. Members of the department.

GERMAN

Students desiring to take German as a major are required to have finished successfully a four-year course of undergraduate work in German, or its equivalent. They are also required to be familiar with the principal works of the writers of the classical and modern periods of German literature, to show a

general knowledge of the history of German literature, and to be able to follow lectures in the German language.

Of collateral subjects, a reading knowledge of French is important and is required for advanced graduate work. Some acquaintance with Latin and with German history is highly desirable.

Courses for Graduates

101. SEMINAR IN GOETHE AND SCHILLER.—Twice a week; both semesters. *One unit.* Professor ARON.

Note.—Course 101 is arranged in a three-year rotation: SEMINAR IN MODERN GERMAN DRAMA, 1939-40; SEMINAR IN THE GERMAN NOVEL, 1940-41. Course S101 is arranged in a two-year rotation: SEMINAR IN VOLKSKUNDE WITH SPECIAL REFERENCE TO THE VOLKSLIED, Summer of 1938, Professor WILLIAMS; SEMINAR IN THE GERMAN LYRIC, Summer of 1939, Professor ARON.

102. THESIS.—Both semesters. *One-half to two units.* Professors ARON, WILLIAMS, Assistant Professor GEISSENDOERFER, Dr. JEHLE.

104. GOTHIC.—Grammar and literature. Twice a week; first semester. *One unit.*

105. OLD HIGH GERMAN.—Grammar and interpretation of the oldest literary documents. Twice a week; second semester. *One unit.*

110. EARLY GERMAN DRAMA.—German drama up to the Reformation. Twice a week; second semester. *One unit.* (Alternates with course 32; not given in 1938-39.)

113. GERMAN LITERATURE OF THE FIFTEENTH AND SIXTEENTH CENTURIES.—Twice a week; second semester. *One unit.* Professor WILLIAMS.

117. GERMAN LITERATURE OF THE SEVENTEENTH AND EIGHTEENTH CENTURIES.—Twice a week; both semesters. *One unit.* (Given in alternate years; not given in 1938-39.) Professor ARON.

121. WALTHER VON DER VOGELWEIDE.—Twice a week; second semester. *One unit.* (Alternates with course 121a.) Professor WILLIAMS.

121a. THE NIBELUNGENLIED.—Twice a week; second semester. *One unit.* (Alternates with course 121; not given in 1938-39.) Professor WILLIAMS.

Courses for Graduates and Advanced Undergraduates

19a–19b. GOETHE'S FAUST.—The Faust legend and early Faust books and plays; the genesis of Goethe's *Faust;* reading of both parts. Twice a week; both semesters. Assistant Professor GEISSENDOERFER.

26a. GERMAN LITERATURE TO 1800.—Three times a week; first semester. Professor ARON.

26b. GERMAN LITERATURE SINCE 1800.—Three times a week; second semester. Professor ARON.

31. MIDDLE HIGH GERMAN.—Twice a week; first semester. Professor WILLIAMS.

32. HISTORY OF GERMAN CIVILIZATION.—Three times a week; first semester. (Alternates with course 110.) Dr. ITTNER.

HISTORY

Graduate work in history requires two years of college work in this subject, or sixteen semester hours, which should ordinarily include introductory courses in European and American history. Linguistic preparation is important, especially in French and German. For medieval history some knowledge of Latin is essential and Spanish is useful for certain fields of American history.

Advanced courses in history at the University of Illinois are of three kinds: (1) Courses for information and guidance in general reading. (2) Instruction in methodology, historiography, and bibliography. A part of this work (in course 103) is required of all graduate students in history during their first year. (3) Seminar courses for the study of special fields with a view primarily to training in the methods of historical criticism and research.

Illinois Historical Survey.—Students of history have an opportunity to pursue research in western history in connection with the Illinois Historical Survey, which is an organization for the purpose of carrying on systematic studies in the history of Illinois.

Attention is also called to the fact that the University of Illinois has for some time coöperated with the Trustees of the State Historical Library in the gathering and editing of archive material. As a result of this relation instructors and graduate students in the department have contributed from time to time to the publications of the Library and have been given useful training in the study of manuscript as well as of printed material.

Higher Degrees in History.—The following statement regarding the specific requirements for higher degrees in history is subject to the general requirements of the Graduate School.

Master of Arts

In addition to meeting the usual tests in the specific courses taken, each candidate for this degree will ordinarily be required to pass a general written examination early in the year and toward the close of the second semester an examination, also written, in two of the following fields: ancient history; medieval history of continental Europe; modern history of continental Europe; English history; American history; Latin-American history; the Near East; the Far East. The candidates are expected to have a general knowledge of historical method (see course 103). The department further requires a working knowledge of one important foreign language, ordinarily French or German.

Doctor of Philosophy

Major Requirements.—A candidate who selects history as his major subject may offer himself for examination in any four of the fields indicated below, stating also the particular field among these four in which he wishes to specialize and in which his thesis is to be written:

1. Ancient history. 2. Medieval history and institutions of continental Europe, to the close of the thirteenth century. 3. Continental Europe from 1300 to 1648. 4. Continental Europe and its dependencies since 1648 (except as included in 5 and 6). 5. The history of England and its dependencies (not including America before 1783). 6. The history of the United States. 7. The history of Latin America. This enumeration of fields is not to be regarded as excluding the possibility of accepting others as may be determined by the department in individual cases.

Minor Subjects.—A candidate for the doctorate in history may select as his first minor one of the divisions of the field of history listed above which is not offered as a part of his major. He should preferably, however, select his minors from subjects offered by other departments. The following list of suitable minors is intended to be suggestive rather than exhaustive or compulsory.

Political Science.—(Any two acceptable for a first minor; any one, for a

second minor.) 1. International law and diplomacy. 2. Modern government. 3. Municipal government. 4. Constitutional and administrative law and jurisprudence. 5. Political theory.

Economics and Sociology.—(Any two acceptable for a first minor; any one, for a second minor.) 1. Economic history. 2. Economic theory. 3. Public and private finance. 4. Social reform. 5. Principles of sociology.

Philosophy and Education.—(Any two acceptable for a first minor; any one, for a second minor.) 1. History of ancient and medieval philosophy. 2. History of modern philosophy. 3. History of education.

Literature.—Some division of the history of literature which may be either comparative literature of a limited period or the literature of a particular country for a more extended period as may be agreed upon in each case.

Courses for Graduates

101. Seminar in American History.—Once a week; two hours; both semesters. *One unit.* Semester I: Introduction to research in American history. Professor Robertson. Semester II: Guidance in the investigation of selected topics. Professor Randall.

102. Seminar in English History.—The Victorian Age, 1846-1898, political and social developments. One a week; two hours; both semesters. *One unit.* Professor Dietz.

103. Studies in Historical Method.—Required of all candidates for an advanced degree in history who do not present evidence of similar training elsewhere. Twice a week; first semester. *One unit.* Assistant Professor Werner.

104. Seminar in Modern History.—Once a week; two hours; both semesters. *One unit.* Professor Lybyer.

105. Research in Special Topics.—Guidance in writing theses for advanced degrees. *One to two units.* Professors Robertson, Lybyer, Pease, Jones, Randall, Dietz, Swain; Associate Professor Rodkey; Assistant Professors Dunbar, Werner, Stearns.

106. Seminar in the History of the Middle Ages.—Arrange hours; both semesters. *One unit.* (Not given in 1938-39.)

117. Social History of the United States since 1865.—Studies in the social aftermath of the Civil War: agrarian unrest; immigration, urbanization, intellectual interests. Once a week; two hours; both semesters. *One unit.* (Not given in 1938-39.)

122. History of the West.—An intensive study of the westward movement, 1740-1765. Twice a week; both semesters. *One unit.* Professor Pease.

126. Spain in Europe and America, 1750-1870.—Bibliography, historiography, and topical reports. Arrange hours; first semester. *One unit.* Professor Robertson.

127. Inter-American Relations.—Relations of the Latin-American nations with each other and with the United States. The Monroe Doctrine, intervention, etc. Arrange hours; second semester. *One unit.* Professor Robertson.

133. Studies in the History of Europe in the Nineteenth Century.—Once a week; two hours; both semesters. *One unit.* Associate Professor Rodkey.

138. Studies in the History of France in the Sixteenth and Seventeenth Centuries.—Twice a week; both semesters. *One unit.* Professor Jones.

150. Seminar in Ancient History.—Problems in the relations of East and West. Arrange hours; both semesters. *One unit.* Professor Swain.

Courses for Graduates and Advanced Undergraduates

16a–16b. The American Colonies in the Eighteenth Century and the Transition to National Life and Organization.—Three times a week; both semesters. Assistant Professor Dunbar.

17a–17b. Social and Economic Forces in the United States in the Nineteenth Century.—Three times a week; both semesters. Assistant Professor Werner.

19a–19b. History of American Immigration.—Twice a week; both semesters. (Not given in 1938-39.)

20a–20b. History of the South.—Twice a week; both semesters. (Not given in 1938-39.) Professor Randall.

21. History of the United States since 1877.—Three times a week; second semester. (Not given in 1938-39.) Professor Randall.

22a–22b. History of the West, 1634-1830.—Twice a week; both semesters. Professor Pease.

25. The Civil War and the Reconstruction.—Three times a week; first semester. (Not given in 1938-39.) Professor Randall.

26. History of the Latin-American Colonies.—Three times a week; first semester. Professor Robertson.

27. History of Latin America from the Wars of Independence to the Present Time.—Three times a week; second semester. Professor Robertson.

29. America and Europe, 1776-1900.—Foundations of international intercourse, with particular reference to the Latin-American colonies and states. Three times a week; second semester. Professor Robertson.

32a–32b. History of Europe since 1878.—Three times a week; both semesters. Professor Lybyer.

36a–36b. History of the German People in Modern Times.—Three times a week; both semesters. Associate Professor Rodkey.

37a–37b. History of Eastern and Southern Asia.—Twice a week; both semesters. Professor Lybyer.

38a–38b. Development of the French Monarchy in the Later Middle Ages and in Early Modern Times, 1285-1648.—Three times a week; both semesters. Professor Jones.

39a–39b. The Renaissance and the Protestant and Catholic Reformations.—The transition from medieval to modern ideals. Three times a week; both semesters. (Not given in 1938-39.) Professor Jones.

44a–44b. Constitutional History of England.—Three times a week; both semesters. Professor Dietz.

46a–46b. Social and Economic History of England, 1750-1938.—Three times a week; both semesters. Professor Dietz.

47a–47b. History of England in the Later Middle Ages and in the Early Modern Period, 1399-1603.—Three times a week; both semesters. (Not given in 1938-39.) Professor Dietz.

55. History of the Ancient Greek States.—Three times a week; first semester. Professor Oldfather.

56. History of the Roman Republic.—Three times a week; second semester. Professor Oldfather.

57a–57b. Ancient Imperialism, Hellenistic and Roman.—Three times a week; both semesters. Professor Swain.

60. The United States in the World War.—Three times a week; second semester. Assistant Professor Werner.

62b. Political and Constitutional Development of the United States since 1809.—Three times a week; second semester. Professor Randall.

HOME ECONOMICS

As preparation for graduate work with a major in foods and nutrition the student must have had at least the equivalent of the foods and nutrition required in the undergraduate curriculum for the general major in home economics and, in addition, 3-5 hours in foods, dietetics, and nutrition; also quantitative chemical analysis.

In addition to graduate courses in home economics the student will offer, for a major in foods and nutrition, either Chemistry 50a or 40 and 41.

Graduate students who choose home economics as a minor for the degree of Doctor of Philosophy must have had adequate preliminary preparation in foods and nutrition and must include among the courses to be taken for the minor either Home Economics 41 and 103 or 35 and 105, or must have had their equivalent. Of the courses open to advanced undergraduates, selection may be made from courses 20, 33, 35, 39a, 39b, and 41.

Courses for Graduates

101. Home Economics.—Twice a week; both semesters. *One unit.* (Not given in 1938-39.) Members of the department.

102. Research in Nutrition.—Both semesters. *One-half to three units.* Associate Professor Outhouse.

103. Nutrition Seminar.—Once a week; both semesters. *One-half unit.* Associate Professor Outhouse.

104. Research in Foods.—Both semesters. *One-half to three units.* Professor Woodruff.

105. Foods Seminar.—Once a week; both semesters. *One-half unit.* Professor Woodruff.

Courses for Graduates and Advanced Undergraduates

20. Physical Growth and Nutrition.—Twice a week; first semester. Associate Professor Outhouse.

28. Organization and Management of the Home.—Twice a week; second semester. Professor Bane, Miss King.

31. Clothing.—Three times a week; second semester. (Not given in 1938-39.) Assistant Professor Whitlock.

33. Diet in Disease.—Three times a week; both semesters. Assistant Professor Barto.

35. Problems in Foods.—Three times a week; both semesters. Professor Woodruff.

39a-39b. Readings in Food and Nutrition.—Once a week; both semesters. Professor Woodruff, Associate Professor Outhouse, Assistant Professor Barto, Dr. Kinsman.

41. Problems in Nutrition.—Three to five times a week; second semester. Associate Professor Outhouse, Dr. Kinsman.

43a–43b. Problems in Textiles and Clothing.—Three times a week; both semesters. Assistant Professor Jacobsen, Miss Eades.

48. Institution Dietaries and Administration.—Three times a week; second semester. Assistant Professor Smith.

50. Costume Design.—Twice a week; second semester. Miss Eades.

51. Textiles.—Three times a week; second semester. (Not given in 1938-39.) Assistant Professor Jacobsen.

56. The Child and His Development.—Twice a week; both semesters.

57a-57b. Problems in Home Management.—Three times a week; both semesters. Professor Bane, Miss King.

62. Food and Nutrition.—Three times a week; first semester. Associate Professor Outhouse, Dr. Kinsman.

HORTICULTURE

Graduate work is offered in the Department of Horticulture leading to the M.S. and Ph.D. degrees. Candidates may specialize for either degree in floriculture, olericulture, or pomology.

Twenty hours of collegiate work in horticulture and allied subjects are required for entrance upon major work, and twelve hours for minor work. The Department will waive certain of these requirements for some lines of major study if the student has had an equivalent preparation in the fundamental sciences. It is desirable when the major field of study is decided upon during the junior or senior year, to select the fundamental science courses accordingly, and if possible, to include in the undergraduate preparation the elementary courses in German or French.

Advanced work in botany, chemistry, entomology, agronomy, or agricultural economics may advantageously be taken with horticulture to make a well-balanced course of graduate study.

Courses for Graduates

103. Olericulture.—Once a week; both semesters. *One to two units.* Professor Lloyd.

105. Marketing Fruits and Vegetables.—See Agricultural Economics 135.

106. Olericulture Seminar.—Once a week; first semester. *One-fourth unit.* Professor Lloyd.

108. Pomology.—Three times a week; both semesters. *One to four units.*
(a) Pomological Problems.—Professor Blair.
(b) Pomology and Fruit Breeding.—Professor Dorsey.
(c) Pomological Physiology.—Professor Ruth.
(d) Small Fruits.—Professor Colby.
(e) Pomological Pathology.—Professor Anderson.

115. Floriculture.—Once a week; both semesters. *One to two units.*
(a) Floricultural Problems.—Professor Dorner.
(b) Floricultural Physiology and Pathology.—Associate Professor Weinard.

120. Pomology Seminar.—Once a week; both semesters. *One-fourth unit.* Professors Dorsey, Ruth, Anderson.

125. Fruit Development.—Three times a week; first semester. *One unit.* Professor Dorsey.

130. Physiology of Fruit Production.—Three times a week; first semester. *One unit.* Professor Ruth.

135. Fruit and Vegetable Disease Research.—Three times a week; both semesters. *One unit.* Professor Anderson.

140. Advanced Small Fruit Culture.—Three times a week; second semester. *One unit.* Professor Colby.

Courses for Graduates and Advanced Undergraduates

43. Greenhouse Fertilizers.—Three times a week; first semester. Associate Professor Weinard.
44. Current Pomological Literature.—Once a week; both semesters. (*Note:* This course may be taken for four successive semesters, designated as Horticulture 44a, 44b, 44c, and 44d.) Professor Ruth.
45. Plant Nutrition.—Three times a week; second semester. Associate Professor Weinard.
46. Marketing Horticultural Products.—See Agricultural Economics 36.
47. Pomological Physiology.—The effects of environment upon fruits. The storage of fruits. Three times a week; first semester. Professor Ruth.
51. Fruit Diseases.—Three times a week; first semester. Professor Anderson.

LIBRARY SCIENCE

Before beginning work for the master's degree in library science, students must have acquired the degree of B.S. in Library Science, or its equivalent in an approved institution, with good scholastic records. They must also present approved experience, a reading knowledge of two modern foreign languages, one of which must be German or French, and recommendations as to professional promise.

A student may combine a major in library science with a minor in any special subject for which he is adequately prepared.

The thesis must be completed within three years after first registration therein, unless there is approval of a longer period based upon unusual contingencies.

Application forms may be secured from the Library School office.

Courses for Graduates

101. Thesis.—*One to two units.* Professor Windsor and others.
102. Seminar.—Both semesters. *One-half to four units.*
(b) University Library Administration.—Once a week; two hours; second semester. *One unit.* Professor Windsor.
(c) Publishers.—Once a week; two hours; first semester. *One unit.* Associate Professor Boyd.
(d) Special Libraries.—
(e) Individual Problems.—*One-half to one unit.* Professor Windsor and others.
(f) Critical Analysis of Current Library Techniques.—*One unit.* (Not given in 1938-39.)
(g) Social Trends.—*One unit.* (Not given in 1938-39.)
(h) Methods of Investigation in Librarianship.—Twice a week; first semester. *One-half unit.* Dr. McDiarmid.

103a-103b. Advanced Reference.—Twice a week; both semesters. *Three-quarters unit each semester.* Miss Phelps.

104a. Advanced Classification.—Once a week; two hours; first semester. *One-half unit.* Associate Professor Bond.

104b. Advanced Cataloging.—Once a week; two hours; second semester. *One-half to one unit.* Associate Professor Bond.

Courses for Graduates and Advanced Undergraduates

7. History of Libraries.—Twice a week; second semester. *One-half unit.* (Not given in 1938-39.)
9. History of Books and Printing.—Twice a week; second semester. *One-half unit.* (Not given in 1938-39.)

13a. Government Publications.—Production, distribution, and use as reference material of United States federal publications. Twice a week; first semester. *Three-quarters unit.* Miss Phelps.

24a. Book Selection for Special Groups.—Foreign literature in translation. Twice a week; first semester. *Three-quarters unit.*

24b. Book Selection for Special Groups.—Selection for socially maladjusted groups; retarded reading groups; therapeutic values of reading. Twice a week; second semester. *One-half unit.*

42. Government Publications.—The use as reference material of American state and municipal documents, and of publications of foreign governments. Three times a week; second semester. *Three-quarters unit.* Miss Phelps.

44. Bookbuying for the Large Library.—Twice a week; first semester. *One-half unit.* (Not given in 1938-39.)

45. Library Buildings and Equipment.—Twice a week; first semester. *One-half unit.* (Not given in 1938-39.)

46. High School Library Administration.—Three times a week; second semester. *One-half unit.*

48. Library Administration.—Special problems. Twice a week; second semester. *One-half unit.* Dr. McDiarmid.

49. Children's Literature.—Twice a week; second semester. *One-half unit.*

51. Books and Libraries.—Three times a week; second semester. *One-half unit.* Miss Singleton.

52. Reading Interests and Habits.—Twice a week; second semester. *One-half unit.* Associate Professor Boyd.

MATHEMATICS

Students entering on graduate study with a major in mathematics must have had twenty hours of undergraduate work in mathematics besides the usual freshman courses in algebra, trigonometry, and analytic geometry, including a one-year course in calculus and one year of more advanced work in one or more of the fields of algebra, analysis, and geometry. They should be able to read German or French.

Candidates for a doctor's degree taking a first minor in mathematics are expected to have completed a course in calculus and are required to take two one-year courses beyond the calculus; candidates for a doctor's degree taking a second minor are required to complete at least one course throughout a year beyond the calculus.

The more technical courses offered by the department are arranged mainly in cycles of two or of three years, so that a properly qualified student will usually have opportunity to take any particular course at some time during the three years of residence required for the doctor's degree.

Courses for Graduates

100. Seminar.—For thesis work, or for special reading with the consent of the instructor. Three times a week; both semesters. *One to two units.* Professors Coble, Carmichael, Emch, Crathorne; Associate Professors Hazlett, Brahana, Trjitzinsky; Assistant Professors Levy, Doob, Hull. For the master's degree: Assistant Professors Bailey, Ketchum, Bourgin; Dr. Steimley, Dr. Pepper, Dr. Miles.

101. Functions of Real Variables.—Three times a week; both semesters. *One unit.* (Not given in 1938-39.)

104. Topology.—Three times a week; both semesters. *One unit.* (Not given in 1938-39.)

109. Seminar in Research Topics.—Time to be arranged; both semesters. *One unit.* Professor Carmichael.

110. Elliptic Functions.—Three times a week; both semesters. *One unit* (Not given in 1938-39.)

111. Differential Equations.—Three times a week; both semesters. *One unit.* Associate Professor Trjitzinsky.

112. Linear Difference Equations.—Three times a week; both semesters. *One unit.* (Not given in 1938-39.) Professor Carmichael.

114. Partial Differential Equations.—Three times a week; both semesters. *One unit.* (Not given in 1938-39.)

115. Advanced Topics in the Theory of Functions.—Modern aspects of the theory of functions of a real and of a complex variable; almost periodic and quasi-analytic functions; current investigations. Three times a week; both semesters. *One unit.* (Not given in 1938-39.) Associate Professor Trjitzinsky.

116. Topics in Classical Analysis.—The theory of the Riemann integral in *n* dimensions, transformations of variables, convergence, orthogonal functions with applications to integral equations, differential operators, etc. Three times a week; second semester. *One unit.* Assistant Professor Doob.

124. Theory of Numbers.—Three times a week; both semesters. *One unit.* Assistant Professor Hull.

126. Theory of Groups.—Three times a week; both semesters. *One unit.* (Not given in 1938-39.) Associate Professor Brahana.

129. Theory of Statistics.—Three times a week; both semesters. *One unit.* Professor Crathorne.

131. Algebraic Geometry.—Three times a week; both semesters. *One unit.* Professor Emch.

135. Differential Geometry.—Three times a week; second semester. *One unit.* Dr. Mendel.

151. Linear Operations.—Orthogonal sets of functions. Fourier and Mellin integrals. Functionals. Direct and indirect methods in variational and integral equations. Spectrum theory. Bounded and unbounded operations in Banach spaces. Foundations of symbolic processes. Mapping methods. Applications to problems in the natural sciences. Three times a week; both semesters. *One unit.* Assistant Professor Bourgin.

169. The Elements of Higher Geometry and Algebra.—Three times a week; both semesters. *One unit.* Associate Professor Brahana.

170. Algebra.—Three times a week; both semesters. *One unit.* Associate Professor Hazlett.

171. Analysis.—Three times a week; both semesters. *One unit.* Assistant Professor Ketchum.

172. Geometry.—Three times a week; both semesters. *One unit.* Professor Coble.

Courses for Graduates and Advanced Undergraduates

16–17. Differential Equations and Advanced Calculus.—Three times a week; both semesters. Associate Professor Boldyreff, Dr. Steimley, Dr. Peters.

21. Theory of Probability.—Three times a week; second semester. Professor Crathorne.

22. Statistics.—May be counted only toward a minor in mathematics. Three times a week; first semester. Professor Crathorne.

30–31. Actuarial Theory.—Three times a week; both semesters. Dr. Welker.

32. History of Mathematics.—Three times a week; second semester. (Not given in 1938-39.)

35. Teachers' Course.—May be counted only toward a minor in mathematics. Three times a week; both semesters. Assistant Professor Bailey.

36. Advanced Aspects of Euclidean Geometry.—Three times a week; second semester. Dr. Moore.

40. Fundamental Concepts of Mathematics.—Three times a week; both semesters. Dr. Pepper.

52. Partial Differential Equations of Mathematical Physics.—Three times a week; both semesters. (Not given in 1938-39.) Assistant Professor Bourgin.

53. Integral and Operational Equations in Mathematical Physics.—Three times a week; both semesters. (Not given in 1938-39.) Assistant Professor Bourgin.

70. Introduction to Higher Algebra.—Three times a week; both semesters. (Not given in 1938-39.)

71. Introduction to Higher Analysis.—Three times a week; both semesters. Assistant Professor Doob.

72. Introduction to Higher Geometry.—Three times a week; both semesters. Assistant Professor Levy.

MECHANICAL ENGINEERING

The prerequisite for graduate work in mechanical engineering is the equivalent of the undergraduate course required for the degree of Bachelor of Science in mechanical engineering in the branches of the subject in which registration is desired. Courses offered to junior and senior students are open for minor credit to students majoring in other departments.

Courses for Graduates

107. Thermodynamics.—The mathematics of thermodynamics; application of thermodynamics to the solution of physical and engineering problems. Twice a week; both semesters. *One unit.*

108. The Flow of Fluids and Heat Transfer.—The application of dimensional analysis and other rational formulas. Special problems. Twice a week; both semesters. *One unit.* Professor Macintire.

109. Mechanical Engineering Design.—(a) Machine design; (b) power plant design; (c) dynamics of machinery. Twice a week; both semesters. *One unit.* Professors Leutwiler, Ham.

110. Advanced Heating, Ventilating, and Air Conditioning.—Applications of various systems, notable developments, and results of research. Individual problems. Twice a week; both semesters. *One unit.* Professor Severns.

112. Laboratory Investigations.—Special problems in: (a) combustion; (b) steam; (c) gas and oil engineering; (d) heating, ventilation, and air conditioning; (e) refrigeration; (f) flow of fluids; (g) heat transfer;

(h) mechanical transmission of power. Three times a week; both semesters. *One and one-half units.* Professors Polson, Kratz, Ham, Macintire, Severns.

117. Advanced Refrigerating Engineering.—Advanced theory and special cycles. Design of comfort cooling and other special installations. Twice a week; both semesters. *One unit.* Professor Macintire.

MINING AND METALLURGICAL ENGINEERING

MINING ENGINEERING

The prerequisite for graduate work in mining engineering is the equivalent of the undergraduate courses required for the degree of Bachelor of Science in mining in the branches of the subject in which registration is desired.

Courses for Graduates

101. Advanced Mining Practice.—Twice a week; either semester. *One unit.* Professor Callen.

102. Advanced Preparation of Coal and Ores.—Twice a week; either semester. *One unit.* (Not given in 1938-39.)

104.[1] Mining Reports.—Twice a week; either semester. *One unit.* Professor Callen.

105.[1] Welfare Work and Education among Mine Employees.—Twice a week; either semester. *One unit.* Professor Callen.

106.[1] Advanced Coal, Ore, and Metallurgical Plant Design.—Twice a week; either semester. *One unit.* (Not given in 1938-39.)

107.[1] Advanced Non-Ferrous Metallurgical Projects.—Twice a week; either semester. *One unit.* (Not given in 1938-39.)

Courses for Graduates and Advanced Undergraduates

6. Mechanical Engineering of Mines.—Three times a week; second semester. Professor Callen.

8. Mine Administration.—Three times a week; first semester. Assistant Professor Nicholson.

9. Preparation of Coal and Ores.—Three times a week; first semester. Assistant Professor Nicholson.

15. Mine Ventilation.—Twice a week; second semester. Professor Callen.

20. Mine Ventilation Laboratory.—Twice a week; second semester. Professor Callen.

21. Mine Examination and Valuation.—Three times a week; second semester. Assistant Professor Nicholson.

41. Mining Design.—Three times a week; first semester. Professor Callen.

42. Mining Design.—Twice a week; second semester. Assistant Professor Nicholson.

64. Coal and Ore Preparation Laboratory.—Twice a week; second semester. Assistant Professor Nicholson.

METALLURGICAL ENGINEERING

The prerequisite for major graduate work in metallurgical engineering is the equivalent of the undergraduate courses in process and physical metallurgy and in mechanics of materials required for the degree of Bachelor of Science in metallurgical engineering. Courses for advanced undergraduates are open for

[1]Of courses 104 and 105 only one will be given either semester, according to election of students; the same applies to courses 106 and 107.

minor credit to students majoring in other departments who have adequate preparation in physics and chemistry. Mechanics of materials is prerequisite for Metallurgy 7, 8, and 10.

Courses for Graduates

101. Thesis.—Both semesters. *One to two units.* Assistant Professor Wilder.

102. Advanced Physical Metallurgy.—Twice a week; first semester. *One unit.* Assistant Professor Wilder.

103.[1] Advanced Metallography: Ferrous Alloys.—Twice a week; second semester. *One unit.* Assistant Professor Wilder.

104.[1] Advanced Metallography: Non-Ferrous Alloys.—Twice a week; second semester. *One unit.* Assistant Professor Wilder.

Courses for Graduates and Advanced Undergraduates

1. Elements of Metallurgy.—Three times a week; first semester.
2. Principles of Metallurgy.—Three times a week; first semester.
3. Fire Assaying.—Twice a week; first semester.
4. Physical Metallurgy.—Three times a week; first semester. Assistant Professor Wilder.
5. Ferrous Metallurgy.—Three times a week; second semester. Assistant Professor Wilder.
6. Metallurgical Calculations.—Twice a week; second semester.
7. Ferrous Metallography.—Three times a week; first semester. Assistant Professor Wilder.
8. Ferrous Metallography Laboratory.—Twice a week; first semester. Assistant Professor Wilder.
9. Non-Ferrous Metallurgy.—Three times a week; first semester.
10. Non-Ferrous Metallography.—Three times a week; second semester.
11. Electrometallurgy.—Three times a week; second semester. Assistant Professor Wilder.
12. Metallography.—Three times a week; second semester.
13. Utilization of Fuels.—Three times a week; first semester. Professor Callen.
41. Metallurgical Design.—Three times a week; first semester. Professor Callen.
42. Metallurgical Design.—Twice a week; second semester.

PHILOSOPHY

Students who enter on graduate work with philosophy as their major subject must have had a general course in the history of philosophy, a course in logic, and a general course in psychology.

Courses for Graduates

103. Ethics.—Twice a week; second semester. *One unit.* Professor Morrow.

105. Seventeenth Century Continental Thought.—Twice a week; first semester. *One unit.* Associate Professor Gotshalk.

106. English and American Idealism.—Twice a week; first semester. *One unit.* (Not given in 1938-39.) Professor Morrow.

[1]Of courses 103 and 104 only one will be given, according to election of students.

108. Plato.—Twice a week; first semester. *One unit.* Professor Tawney.

110. Locke, Berkeley, Hume.—Twice a week; first semester. *One unit.* Professor Morrow.

112. German Idealism (Kant).—Twice a week; second semester. *One unit.* Associate Professor Gotshalk.

118. Platonic Tradition in Medieval Thought.—Twice a week; second semester. *One unit.* Professor Tawney.

119. Seminar in Ancient Philosophy.—Twice a week; first semester. *One unit.*

120. Seminar in Modern Philosophy.—Twice a week; second semester. *One unit.*

124. Contemporary Problems.—Twice a week; second semester. *One unit.* Associate Professor Gotshalk.

125. Development of Mind, Self, and Value.—Twice a week; second semester. *One unit.* Professor Tawney.

Courses for Advanced Undergraduates and Graduates

3. History of Ancient and Medieval Philosophy.—Three times a week; first semester. Professor Morrow.

4. History of Modern Philosophy.—Three times a week; second semester. Associate Professor Gotshalk.

8. Philosophy of the Recent Past.—Three times a week; first semester. (Not given in 1938-39.) Associate Professor Nicholson.

9. Philosophy of Law and of the State.—Three times a week; second semester. Professor Morrow.

11a. Philosophy of Religion (Systematic).—Three times a week; first semester. Professor Tawney.

11b. Philosophy of Religion (Historical).—Three times a week; second semester. Professor Tawney.

12. Philosophy of Art.—Three times a week; first semester. Associate Professor Gotshalk.

16. Metaphysics.—Three times a week; second semester. Associate Professor Gotshalk.

21. Theory of Knowledge.—Three times a week; first semester. Dr. Will.

PHYSICAL EDUCATION

Students may take a graduate study minor in the field of physical education. The prerequisite is twenty semester hours of approved undergraduate credit in the subject. Students who present evidence of satisfactory teaching experience in the field may have this requirement reduced.

The courses listed below are open to both men and women.

Courses for Graduates and Advanced Undergraduates

31. Problems in Physical Education.—Deals particularly with the curriculum. Once a week; first semester. *One unit.* Professor Staley.

32. Problems in School Health.—Deals particularly with health service programs. Once a week; second semester. *One unit.* Associate Professor Stafford.

PHYSICS

A year of calculus and a year of general physics, with laboratory, are prerequisite for all major and minor graduate work in physics. In addition, graduate students majoring in physics must have had one more advanced course in either physics or mathematics and should be able to use references in German.

Courses for Graduates

108. Nuclear Physics.—Three times a week; first semester. *One unit.* (Not given in 1938-39.) Associate Professor Kruger.

109. Historical Development of Physics.—One two-hour period a week; second semester. *One unit.* Associate Professor Schulz.

122. Dynamics.—Three times a week; both semesters. *One unit.* Assistant Professor Mott-Smith.

123. Dynamical Theory of Sound.—Three times a week; second semester. *One unit.* Professor Watson.

124. Conduction of Electricity through Gases.—Three times a week; first semester. *One unit.* (Not given in 1938-39.) Assistant Professor Mott-Smith.

125. Hydrodynamics. — Especially modern problems in flow and turbulence. Twice a week; both semesters. *One-half unit.* Professor Kunz.

126. Theory of Elasticity.—Three times a week; both semesters. *One unit.* (Not given in 1938-39.) Professor Kunz.

127. Relativity.—Twice a week; both semesters. *One-half unit.* (Not given in 1938-39.) Professor Kunz.

128. Problems and Methods in Theoretical Physics.—Three times a week; first semester. *One unit.* (Not given in 1938-39.) Professor Kunz.

129. Mechanical Vibrations.—The general theory, with applications to plates, rotating shafts, gyroscopes, structures, etc. Twice a week; both semesters. *One-half unit.* (Not given in 1938-39.) Professor Kunz.

131. Physical Laboratory Technique.—Both semesters. *One unit.* (Not given in 1938-39.) Associate Professor Kruger.

144. Advanced Electric and Magnetic Measurements.—Both semesters. *One unit.* (Not given in 1938-39.) Associate Professor Williams.

146. Electrodynamics.—Three times a week; both semesters. *One unit.* Professor Kunz.

147. Electric Oscillations.—Twice a week; both semesters. *One-half unit.* (Not given in 1938-39.) Professor Kunz.

160. Thermodynamics.—Three times a week; first semester. *One unit.* (Not given in 1938-39.) Professor Kunz.

163. Statistical Mechanics.—Three times a week; second semester. *One unit.* (Not given in 1938-39.) Assistant Professor Mott-Smith.

170. Light.—Largely physical optics and spectroscopy. Lectures, assigned readings and recitations, with laboratory experiments. Both semesters. *One to two units.* Assistant Professor Almy.

183. Nuclear Structure.—Three times a week; both semesters. *One unit.* (Not given in 1938-39.) Associate Professor Bartlett.

184. Line Spectra and Atomic Structure.—Three times a week; first semester. *One unit.* Assistant Professor Almy.

185. Band Spectra and Molecular Structure.—Three times a week; second semester. *One unit.* Assistant Professor Almy.

186. Quantum Mechanics.—Three times a week; both semesters. *One unit.* Associate Professor Bartlett.

190. Research.—Both semesters. *One to three units.* Professors in the department.

198. Seminar.—Both semesters. *One to two units.* Professors in the department.

199. Physics Colloquium.—Attendance is expected of all graduate students. Once a week; both semesters. *No credit.* Assistant Professor Mott-Smith.

Courses for Graduates and Advanced Undergraduates

14a-14b. Theoretical Mechanics.—Three times a week; both semesters. Assistant Professor Mott-Smith.

15. Elementary Electricity and Magnetism.—Recommended to students in non-technical courses. Two recitations or lectures and one three-hour laboratory exercise weekly; second semester. Associate Professor Williams.

16. Heat.—Introductory course. Three times a week; first semester. Associate Professor Paton.

17. Light.—Recommended to students in non-technical courses. Two lectures and a three-hour laboratory period weekly; first semester. Associate Professor Schulz.

23. Sound.—Three times a week; first semester. Professor Watson.

25. Architectural Acoustics.—Twice a week; second semester. Professor Watson.

30. Introduction to Theoretical Electricity. — For advanced students in physics, chemistry, mathematics, and engineering. Three times a week; first semester. Associate Professor Williams.

40a–40b. Electricity and Magnetism.—Two lectures and a three-hour laboratory period weekly; both semesters. Dr. Jordan.

44a. Electric and Magnetic Measurements.—Two three-hour periods a week; both semesters. Associate Professor Williams.

46. Advanced Electrical Measurements.—One lecture and two three-hour laboratory periods weekly; second semester.

51. Practical Optics. — Two lectures and a three-hour laboratory period weekly; second semester. (Not given in 1938-39.) Associate Professor Schulz.

60. Heat.—Three times a week; first semester. Associate Professor Paton.

61. Heat Laboratory.—To accompany Physics 60. One three-hour period a week; first semester. Associate Professor Paton.

62. Kinetic Theory of Heat and Radiation.—Three times a week; second semester. Associate Professor Paton.

71a–71b. Light.—For advanced students in physics, chemistry, mathematics or engineering. Twice a week; both semesters. Assistant Professor Almy.

72a–72b. Light Laboratory.—To accompany Physics 71a-71b. Twice a week; both semesters. Assistant Professor Almy.

73. Photography.—Two lectures and two three-hour laboratory periods a week; second semester. Assistant Professor Almy.

78. Radioactivity, Nuclear Physics, and X-rays.—Three times a week; second semester. Associate Professor Kruger.

80. Atomic Physics.—A lecture and problem course presenting our modern knowledge of the nature and properties of atoms, ions, electrons, protons, positrons, light quanta, photoelectricity, thermoelectric emission, x-rays, radioactivity, and cosmic rays. Three times a week; first semester. Associate Professor Kruger.

PHYSIOLOGY

The prerequisites for graduate work in physiology are Physiology 1, 1a, 5, 6, and 7, or equivalents.

Courses for Graduates

101. Journal Club.—Review of literature. Both semesters. *One-fourth unit.* Associate Professor Burge.

102. Research.—Both semesters. *One to two units.* Associate Professor Burge.

103. Experimental Physiology.—Special Phases of the Physiology of Respiration, Circulation, Digestion, Metabolism, Excretion, Secretion, Glands of Internal Secretion, Nervous System. Both semesters. *One-half to one unit.* Associate Professor Burge, Assistant Professor Steggerda.

Courses for Graduates and Advanced Undergraduates

6–7. Advanced Mammalian Physiology.—Five times a week; both semesters. Assistant Professor Steggerda.

POLITICAL SCIENCE

Graduate work in political science is conducted in the following special fields: (1) political theory; (2) international law and diplomacy; (3) modern government; (4) constitutional law, administrative law, and jurisprudence; (5) public administration.

To be admitted to take political science as a major subject, the student must have had at least 18 hours of undergraduate work in political science, economics, and history, not less than nine hours of which have been in political science. To take political science as a minor he must have had at least nine hours' work in these fields, including six hours in political science.

If a student making political science his major is taking both of his minors in other departments, one of them must be in history, economics, or sociology.

Several courses given in other departments are so closely related to those in political science that graduate students whose major is political science may be permitted on petition to take such courses as part of their major work. Attention is called to the courses in public law in the College of Law, the courses in public finance in the College of Commerce and Business Administration, the courses in city planning given by the College of Fine and Applied Arts, and the technical courses in municipal and sanitary engineering in the College of Engineering.

Courses for Graduates

101. History of Political Theories.—Three times a week; first semester. *One unit.* Professor Garner.

102. The Nature of the State.—Twice a week; second semester. *One unit.* Professor Fairlie.

103. Seminar in Political Science and Public Law.—Once a week; both semesters. Members of the department.

104. Municipal Administration.—Twice a week; second semester. *One unit.* (Not given in 1938-39.) Associate Professor Kneier.

105. Constitutional Law: Research in Selected Topics.—Twice a week; first semester. *One unit.* Professor Mathews.

106a–106b. Special Topics in International Law.—Research course. Twice a week; both semesters. *One unit.* Professor Garner.

107. Foreign Relations of the United States.—Twice a week; first semester. *One unit.* (Not given in 1938-39.) Professor Mathews.

108. Problems of International Organization.—Special problems in the field of international organization, with particular attention to the League of Nations. Twice a week; first semester. *One unit.* Professor Berdahl.

112. Public Administration.—Special topics in national, state, or local administration in the United States. Twice a week; first semester. *One unit.* Professor Fairlie.

113. State Government: Research in Selected Topics.—First semester. *One unit.* (Not given in 1938-39.) Professor Mathews.

114. Political Parties.—Twice a week; second semester. *One unit.* Professor Berdahl.

121. Problems in British Government.—Once a week; time to be arranged. *One unit.* Professor Fairlie.

128. Contemporary Governmental Problems.—Twice a week; second semester. *One unit.*

Courses for Graduates and Advanced Undergraduates

4. Municipal Government.—Three times a week; first semester. Dr. Snider.

5. The American Constitutional System.—Three times a week; first semester. Professor Mathews.

6a. International Law.—Three times a week; first semester. Professor Garner.

6b. International Law.—(Continuation of 6a.) Three times a week; second semester. Professor Garner.

7. American Foreign Relations.—Twice a week; second semester. Professor Mathews.

8. International Organization.—Twice a week; first semseter. Professor Berdahl.

9. Principles of Jurisprudence.—Three times a week; second semester. Professor Fairlie.

11. The Constitution and Industrial Legislation.—Three times a week; second semester. Dr. Hagan.

12. Public Administration.—Three times a week; first semester. Professor Fairlie.

13. Government Regulation of Business.—Three times a week; first semester. Dr. Hagan.

14a. Political Parties: Party History and Issues.—Three times a week; second semester. (Not given in 1938-39; alternates with Political Science 14b.) Professor Berdahl.

14b. Political Parties: Party Organization and Methods.—Three times a week; second semester. Professor Berdahl.

18. Legislation in the United States.—Three times a week; second semester. (Not given in 1938-39.)

21. British Government.—Twice a week; first semester. Professor Fairlie.

22. Continental European Governments.—The constitutions and political systems of the principal countries of continental Europe. Three times a week; second semester. Professor Garner.

28. Current Governmental Problems.—Twice a week; second semester. (Not given in 1938-39.)

32. Principles of Political Science.—Twice a week; second semester. Professor Fairlie.

34. Municipal Problems.—Municipal administration in the United States and Europe. Three times a week; second semester. Dr. Snider.

PSYCHOLOGY

Graduate students who elect psychology as their major subject must have had standard courses, of university grade, both in general psychology and in the psychological laboratory. One general university course is the minimal requirement for graduate students who apply to the department for a minor subject.

Training in clinical psychology is provided by courses offered at the Institute for Juvenile Research in Chicago. The prerequisite to these courses is recommendation by the Department of Psychology and one year of graduate

work with a major in psychology, or, in case of especially qualified students who have majored in psychology as undergraduates, one semester of graduate work. The minimum period of attendance at the Institute necessary for the Master of Arts degree is six months; and for the Doctor of Philosophy degree, one academic year. Recommended minors are education and sociology.

Courses for Graduates

103. Research.—Experimental investigations. Both semesters. *One-half to two units.* Professors Woodrow, Young; Associate Professor Higginson; Assistant Professor Anderson.

105. Seminar. — Discussion of current topics in their historical setting, with especial emphasis upon research problems. Both semesters. *One unit.* Professor Woodrow.

106. Neural Theory of the Psychological Functions.—First semester. *One unit.*

108. Quantitative Methods.—The logic of research methods in psychology. Second semester. *One unit.*

109. Problems of Motivation.—Discussion of current research and concepts within the field of motivation. Second semester. *One unit.* Professor Young.

115. Advanced Child Psychology.—Critical evaluation of research methods and findings; practice in selected techniques of child study including experimental and clinical approaches. First semester. *One unit.* Assistant Professor Anderson.

The following courses (counted as courses in psychology when taken by candidates for advanced degrees in psychology) are offered at the Institute for Juvenile Research in Chicago by the Department of Criminology, Social Hygiene, and Medical Jurisprudence of the College of Medicine.

101. Research in Juvenile Behavior.—*One to three units.* Professor Schroeder.

102. Advanced Work in Juvenile Behavior.—*One to three units.* Professor Schroeder.

103. Special Abilities and Disabilities.—*One or two units.* Associate Professor Brown.

104. Psychological Tests.—*One or two units.* Associate Professor Brown.

105. Psychology of Behavior Problems.—*One or two units.* Associate Professor Brown.

Courses for Graduates and Advanced Undergraduates

5. Comparative Psychology.—A systematic survey of animal behavior with particular reference to the behavior of the vertebrates. Laboratory and discussion. Three times a week; first semester. Dr. McAllister.

9. Physiological Psychology.—The physiological basis of conscious experience. Twice a week; first semester.

11. Learning and Comprehension. — Processes and functions in acquiring knowledge and skill. Twice a week; first semester.

12–13. Minor Problems (Advanced Laboratory).—Application of methods suitable to new problems in general and comparative psychology. Three times a week; both semesters. Associate Professor Higginson, Dr. McAllister.

14. Social Psychology.—Psychological factors in the control of group behavior and the adjustment of the individual to social situations. Three times a week; second semester. Dr. McAllister.

16. Genetic Psychology.—The psychological development of the individual with special reference to childhood. Twice a week; second semester. Assistant Professor Anderson.

17. History of Psychology.—Twice a week; first semester. Professor Young.

18. Perception.—Perceptual experience; recent revisions of perceptual theory including the doctrine of the *Gestalt*. Lectures and discussions. Twice a week; second semester.

20. Systematic Psychology.—A critical study of contemporary systems: behaviorism, *Gestalt psychologie,* structural, functional and dynamic psychology. For seniors and graduates. Twice a week; second semester. Professor Woodrow.

21. Character and Personality.—An analysis of the non-intellectual aspects and determinants of mentality and conduct, with special applications to behavior problems and personnel psychology. Three times a week; first semester. (Not open to students who have completed Education 15.) Assistant Professor Anderson.

23. Abnormal Psychology. — Analytical consideration of types of behavior deviating from the normal. Three times a week; second semester.

26. Psychology of Thinking.—A consideration of facts and theories based on experimental studies. Three times a week; first semester. Dr. McAllister.

28. Motivation.—Drive, purpose, attitude, desire, sentiment, social incentives as determinants of behavior; conflict and adjustment. Twice a week; second semester. Professor Young.

34. Individual Differences.—A study of the variation in the mental characteristics of individuals and of groups. Three times a week; first semester. Professor Woodrow.

RAILWAY ENGINEERING

The prerequisite for graduate work in railway engineering is the equivalent of the undergraduate courses required for the degree of Bachelor of Science in engineering in the branch of the subject in which registration is desired.

Undergraduate courses 5 and 8 (Railway Laboratory) may be taken for major credit (½ unit each) toward the master's degree in railway engineering. Certain other undergraduate courses may be taken for minor credit.

Courses for Graduates

102. Locomotive Design.—Economic and legal considerations; specifications; weight distribution; relation of steam pressure, compounding, and superheat to performance and economy. Once a week; first and second semester. *Two units.* Or, once a week; either semester. *One unit.* Professor Young.

106. Locomotive Operation.—Train resistance and locomotive tractive force; locomotive tonnage ratings. Once a week; first and second semester. *Two units.* Or, once a week; either semester. *One unit.* Professor Schmidt.

110. Railway Location.—Effect of location on earning capacity; problems in original location, relocation, and reduction of grades of existing lines. Once a week; first and second semester. *Two units.* Or, once a week; either semester. *One unit.* Professor King.

ROMANCE LANGUAGES AND LITERATURE

A student entering on graduate work for an advanced degree must have had at least three years of college work in his major subject, including one advanced literary course.

Students who enter with a knowledge of Latin and of a second Romance language, together with a reading knowledge of German, will find their work for an advanced degree greatly facilitated.

FRENCH

Courses for Graduates

101. Old French Literature.—Twice a week; both semesters. *One unit.* Professor Oliver.

102. Villon, Rabelais, Montaigne, La Pléiade.—Twice a week; both semesters. *One unit.* Associate Professor Will.

103. Seventeenth Century Literature.—Twice a week; both semesters. *One unit.* (Not given in 1938-39.) Professor Oliver.

104. Eighteenth Century Literature.—Twice a week; both semesters. *One unit.* Professor Oliver.

127. French Romanticism.—Twice a week; both semesters. *One unit.* Professor Carnahan.

128. Origin and Development of the Novel in France.—Twice a week; both semesters. *One unit.* (Not given in 1938-39.) Professor Carnahan.

129. Research Problems in French Romanticism.—Twice a week; both semesters. *One unit.* Professor Carnahan.

132. French Symbolism in Prose and Verse and the English and American Influences.—Twice a week; both semesters. *One unit.* Professor Michaud.

133. Victor Hugo, His Influence and His Critics.—Twice a week; both semesters. *One unit.* (Not given in 1938-39.) Professor Michaud.

144. Le Réalisme et le Naturalisme Français.—(In French.) Twice a week; both semesters. *One unit.* Professor Michaud.

145. Doctrines Littéraires et Courants d'Idées Contemporains.—(In French.) Twice a week; both semesters. *One unit.* (Not given in 1938-39.) Professor Michaud.

175. Old French Phonology and Morphology.—Twice a week; both semesters. *One unit.* (Not given in 1938-39.) Professor Oliver.

195. Seminar.—Research work in special topics. Both semesters. *One to two units.* Members of the department.

Courses for Graduates and Advanced Undergraduates

10a–10b. General Survey of French Literature.—Three times a week; both semesters. Professor Carnahan.

17a–17b. French Drama of the Nineteenth Century.—Twice a week; both semesters. Associate Professors Hamilton, Will.

24a–24b. French Drama of the Seventeenth and Eighteenth Centuries.—Three times a week; both semesters. Professor Oliver.

32a–32b. French Novel of the Nineteenth Century.—Three times a week; both semesters. Semester I, Assistant Professor Jacob. Semester II, Dr. Keating.

33a–33b. La Littérature Contemporaine.—(In French.) Twice a week; both semesters. (Not given in 1938-39.) Professor Michaud.

35a–35b. Civilisation Française. (Développement de la Culture Française). —(In French.) Twice a week; both semesters. Professor Michaud.

ITALIAN

Courses for Graduates

140. Italian Literature in the Middle Ages. Petrarch, Boccaccio.—Twice a week; both semesters. *One unit.* (Not given in 1938-39.) Professor Van Horne.

143. Italian Literature in the Renaissance.—Twice a week; first semester. *One unit.* Professor Van Horne.

146. Modern Italian Literature.—Twice a week; both semesters. *One unit.* (Not given in 1938-39.) Professor Van Horne.

195. Seminar.—Research work in special topics. Both semesters. *One to two units.* Professor Van Horne and members of the department.

Courses for Graduates and Advanced Undergraduates

3a–3b. Dante: The Divine Comedy.—Twice a week; both semesters. Miss Pietrangeli.

SPANISH

Courses for Graduates

130. Spanish Literature in the Sixteenth Century.—Twice a week; first semester. *One unit.* Professor Van Horne.

131. Spanish Literature in the Seventeenth Century.—Twice a week; both semesters. *One unit.* (Not given in 1938-39.) Professor Van Horne.

134. Spanish Literature in the Eighteenth Century.—Twice a week; both semesters. *One unit.* (Not given in 1938-39.) Associate Professor Hamilton.

135. La Novela Española Moderna.—(In Spanish.) Twice a week; both semesters. *One unit.* Semester I, Professor Van Horne. Semester II, Associate Professor Hamilton.

138. Spanish-American Literature.—Twice a week; both semesters. *One unit.* (Not given in 1938-39.) Professor Van Horne.

139. Spanish Literature in the Middle Ages.—Twice a week; both semesters. *One unit.* (Not given in 1938-39.) Associate Professor Hamilton.

185. Old Spanish Readings.—Twice a week; both semesters. *One unit.* Associate Professor Hamilton.

195. Seminar.—Research work in special topics. Both semesters. *One to two units.* Members of the department.

Courses for Graduates and Advanced Undergraduates

10a–10b. General Survey of Spanish Literature.—Three times a week; both semesters. Associate Professor Hamilton.

11a–11b. Cervantes: Don Quixote.—Twice a week; both semesters. Dr. Brett.

17a–17b. Modern Spanish Drama.—Twice a week; both semesters. Associate Professor Hamilton.

SOCIOLOGY

Preparation for major work in sociology must include at least the equivalent of twenty-three semester hours in the social and biological sciences, of which at least eight must be in sociology. The remaining fifteen hours may be distributed among economics, philosophy, history, psychology, political science, and biology (heredity). Preparation for graduate work in sociology as a minor requires at least six hours of credit in sociology.

Courses for Graduates

100. General Sociology.—Twice a week; first semester. *One-half to one unit.* Professor Hiller.

102. Recent Developments in Sociology.—Twice a week; second semester. *One unit.* Assistant Professor Albig.

106. Urban Communities and Urbanization.—Twice a week; first semester. *One unit.* Assistant Professor Tylor.

107. Rural Communities.—Twice a week; second semester. *One unit.* (Not given in 1938-39.) Assistant Professor Tylor.

108. Research in the Social Effects of Poverty, and Their Prevention and Treatment.—Twice a week; first semester. *One unit.* Assistant Professor Timmons.

109. Research in Criminology.—Twice a week; second semester. *One unit.* Professor Taft.

110. Population Problems.—Twice a week; second semester. *One unit.* (Not given in 1938-39.) Professor Taft.

121. Folk Sociology.—Twice a week; second semester. *One unit.* (Not given in 1938-39.)

122. Regional Problems and Planning.—Twice a week; second semester. *One unit.* (Not given in 1938-39.)

124. Advanced Penology.—Twice a week; first semester. *One unit.* (Not given in 1938-39.) Professor Taft.

128. Fusion of Culture Resulting from Immigration.—Twice a week; second semester. *One unit.* (Not given in 1938-39.) Professor Hiller.

129. Modern Human Migrations.—Twice a week; first semester. *One unit.* (Not given in 1938-39.) Professor Taft.

150. Seminar and Research.—The field, type, and amount of work are to be adjusted to the needs of the student in the respective graduate years. *One-half to three units.* Members of the department.

Courses for Graduates and Advanced Undergraduates

3. Social Evolution.—Three times a week; first or second semester. Mr. Ahrens.

5. The Family.—Three times a week; first or second semester. Assistant Professor Timmons.

6. Urban Sociology.—Three times a week; first semester. Assistant Professor Tylor.

7. Rural Sociology.—Three times a week; second semester. (Not given in 1938-39.) Assistant Professor Tylor.

8. Charities.—Three times a week; first semester. Assistant Professor Timmons.

9. Criminology.—Three times a week; second semester. Professor Taft.

10. Population Problems and Human Ecology.—Three times a week; second semester. (Given in alternate years; not given in 1938-39.) Professor Hiller.

14. Group Opinion.—Three times a week; first or second semester. Assistant Professor Albig.

17. Methods of Sociological Research.—Three times a week; first semester. Professor Hiller.

18. Recent Developments in Public Welfare Administration.—Three times a week; second semester. Assistant Professor Timmons.

20. Social Progress and Social Values.—Three times a week; second semester. (Not given in 1938-39.)

24. Penology.—Three times a week; second semester. Professor Taft.

27. Community Welfare Organization.—Three times a week; second semester. Assistant Professor Timmons.

28. Immigration, Assimilation, and Culture Diffusion.—Three times a week; second semester. (Not given in 1938-39.) Professor Hiller.

29. Modern Human Migrations.—Three times a week; first semester. (Not given in 1938-39.) Professor Taft.

30. Races of Mankind.—Three times a week; first semester. (Not given in 1938-39.)

40. Ethnology of the American Indians.—Three times a week; first semester. (Not given in 1938-39.)

42. Primitive Societies.—Three times a week; first semester. Assistant Professor Albig.

44. The Negro.—Three times a week; second semester. (Not given in 1938-39.)

45. Prehistoric Archeology.—Three times a week; first semester. (Not given in 1938-39.)

THEORETICAL AND APPLIED MECHANICS

The prerequisite for the courses for graduates in theoretical and applied mechanics is the equivalent of the undergraduate courses in theoretical and applied mechanics required for the degree of Bachelor of Science in engineering.

Courses offered to senior students are open for minor credit to students majoring in other departments.

Courses for Graduates

101. The Development of Basic Ideas in Mechanics.—Twice a week; first semester. *One unit.* Professor Moore.

103. Hydraulics.—Twice a week; either semester. *One unit.* Professor Enger, Assistant Professor Kittredge.

107. Laboratory Investigations in Strength of Materials.—Twice a week; both semesters. *One-half to two units.* Professor Moore

108. Laboratory Investigations in Hydraulics.—Twice a week; both semesters. *One to two units.* Professor Enger, Assistant Professor Kittredge.

109. Laboratory Investigations in Plain and Reinforced Concrete.—Twice a week; both semesters. *One to two units.* Professor Richart.

110. Analytical Study of Experimental Work on Reinforced Concrete.—Beams, frames, and footings. Twice a week; first semester. *One unit.* Professor Richart.

111. Analytical Study of Experimental Work on Reinforced Concrete.—Columns and slabs. Twice a week; second semester. *One unit.* Professor Richart.

112. Structural Mechanics.—Three times a week; first semester. *One unit.* Assistant Professor Schwalbe.

113. Selected Topics in Structural Mechanics.—Twice a week; second semester. *One-half unit.*

114. Theory of Elasticity with Applications to Engineering Problems.—Three times a week; first semester. *One unit.* Assistant Professor Newmark.

115. Theory of Elasticity with Applications to Engineering Problems (Continuation of 114).—Twice a week; second semester. *One unit.* Assistant Professor Newmark.

116. Resistance of Materials.—Three times a week; first semester. *One-half to one unit.* Professor Seely.

117. Properties of Engineering Materials.—Three times a week; second semester. *One-half to one unit.* Professor Seely.

198. Thesis.—Both semesters. *One unit.* Members of the department.

Courses for Graduates and Advanced Undergraduates

41. Advanced Mechanics of Materials.—Three times a week; first semester. Professor Seely, Assistant Professor Dolan.

42. Engineering Materials.—Three times a week; second semester. Professor Seely, Mr. Collins.

43. Laboratory Work in Hydraulics.—Twice a week; first and second semesters. Assistant Professor Lansford.

44. Laboratory Work in Testing Materials.—Twice a week; first and second semesters. Professor Putnam.

ZOOLOGY

At least sixteen semester hours of college work in zoology are required for entering on major graduate study in this subject. Under special circumstances advanced work in closely allied subjects may be accepted in lieu of the fourth semester's work in zoology. When zoology is chosen for a minor the courses listed for graduates and undergraduates must be preceded by at least one full year's undergraduate work in zoology.

For the prosecution of graduate study in zoology a reading knowledge of German and French is indispensable and familiarity with Latin and Greek is of great advantage.

No special degree in wildlife management is offered in this department, but as preparation for work of this type, students are advised to select courses from the following list: Zoology 11, 17, 18, 19a-b, 31, 109, 110, 111, 125, and research courses, with a minor in botany, physiology, entomology, or bacteriology.

Graduate students specializing in zoology are strongly advised to spend at least one summer in study at the seashore. Every candidate for the doctor's

degree will be required to furnish evidence of having completed satisfactorily at least one six-week period in such work at an approved location.

Courses for Graduates

102. Evolution of Vertebrates.—Twice a week; first semester. *One unit.* (Given in alternate years; not given in 1938-39.) Associate Professor Adams.

103. Cytology.—Twice a week; both semesters. *One unit.* (Given in 1938-39 and in alternate years.) Professor Shumway.

106. General Embryology.—Problems of development. Twice a week; both semesters. *One unit.* (Given in alternate years; not given in 1938-39.) Professor Shumway.

109. Physiological Ecology.—Twice a week; second semester. *One-half to one unit.* (Given in 1938-39 and in alternate years.) Professor Shelford, Assistant Professor Kendeigh.

110. Climatic Ecology.—Twice a week; second semester. *One-half to one unit.* (Given in alternate years; not given in 1938-39.) Professor Shelford.

111. Experimental and Field Ecology.—Saturdays; both semesters. *One-half to two units.* Professor Shelford.

115. Factors of Individual and Racial Development.—Twice a week; both semesters. *One unit.* Professor Zeleny.

117. Invertebrate Taxonomy.—Twice a week; second semester. *One-half to one unit.* Professor Van Cleave.

118. Advanced Protozoology.—Twice a week; second semester. *One unit.* Associate Professor Kudo.

131. Helminthology.—Twice a week; first semester. *One-half to one unit.* Professor Van Cleave and Assistant Professor Thomas.

Individual Research Courses

Note: These courses may be taken by students who can attend classes only on Saturdays.

121. Invertebrate Zoology and Parasitology.—*One to two units.* Professor Van Cleave and Assistant Professor Thomas.

122. Vertebrate Morphology.—*One to two units.* Associate Professor Adams.

124. Experimental Zoology and Genetics.—*One to two units.* Professor Zeleny, Dr. Luce, Dr. Hall.

125. Ecology and Wildlife Management.—*One to two units.* Professor Shelford, Assistant Professor Kendeigh.

126. Vertebrate Embryology and Cytology.—*One to two units.* Professor Shumway, Assistant Professor Adamstone.

128. Protozoology.—*One to two units.* Associate Professor Kudo.

Courses for Graduates and Advanced Undergraduates

11. Animal Ecology and Geography.—Three or four times a week; first semester. Professor Shelford.

17. Field Zoology.—Two or three times a week; first semester. Professor Van Cleave.

18. Protozoology.—Twice a week; first semester. Associate Professor Kudo.

19a. Vertebrate Ecology and Wildlife Management.—Twice a week; first semester. Assistant Professor Kendeigh, Professor Shelford.

19b. Vertebrate Ecology.—Twice a week; second semester. Assistant Professor Kendeigh.

20a–20b. Current Investigations.—Must be taken by all graduate students whose major is in zoology. Once a week; both semesters. Members of the department.

21a–21b. Introduction to Zoological Research.—Two to five times a week; both semesters. May be taken by students who can attend classes only on Saturdays. Members of the department.

22–23. Comparative Anatomy of Vertebrates.—Two to four times a week; both semesters. Associate Professor Adams.

25. Experimental Genetics.—Three times a week; second semester. Dr. Luce.

31. Helminthology.—Twice a week; second semester. Assistant Professor Thomas.

63. Comparative Vertebrate Embryology.—Two to five times a week; first semester. Professor Shumway.

66. Vertebrate Organogeny.—Two to five times a week; second semester. Professor Shumway.

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UNIVERSITY OF ILLINOIS

The Graduate School

Announcement for 1939-1940

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GRADUATE SCHOOL CALENDAR

Graduate students will find it to their advantage to observe the dates in this calendar

Summer Session

1939

June 19, Monday.....Registration day.
June 20, Tuesday.....Instruction begins.
July 7, Friday.....Latest date for registering for French and German examinations.
July 14, Friday.....Examination in French.
July 21, Friday.....Examination in German.
Aug. 5, Saturday, 12 M.....Latest date for candidates for masters' degrees in August to deposit theses.
Aug. 11, 12, Friday, Saturday.....Summer Session examinations.

First Semester

Sept. 15, 16, Friday, Saturday.....Registration days.
Sept. 16, Saturday.....Latest date for registration of former student without penalty.
Sept. 16, Saturday.....Latest date for registering for French and German examinations.
Sept. 16, Saturday.....Latest date for candidates for Ph.D. degree in October to deposit theses.
Sept. 18, Monday.....Latest date for candidates for masters' degrees in October to file applications for degrees and to deposit theses.
Sept. 20, Wednesday, 8 A.M.....Instruction begins.
Sept. 29, Friday.....Examination in French.
Sept. 30, Saturday.....Latest date for Ph.D. finals for degree in October.
Oct. 6, Friday.....Examination in German.
Oct. 7, Saturday, 12 M.....Latest date for changing study-lists without fee.
Oct. 14, Saturday.....Latest date for preliminary examinations (for full residence).
Nov. 1, Wednesday.....Latest date for candidates for professional engineering degrees to file statements of professional study and experience.
Nov. 29, Wednesday, 12 M.....Thanksgiving recess begins.
Dec. 4, Monday, 1 P.M.....Thanksgiving recess ends.
Dec. 20, Wednesday, 8 A.M.....Holiday recess begins.
Dec. 30, Saturday, 12 M.....Latest date for candidates for professional engineering degrees to submit outlines of theses.

1940

Jan. 3, Wednesday, 8 A.M.....Holiday recess ends.
Jan. 13, Saturday, 12 M.....Latest date for registering for French and German examinations.
Jan. 15, Monday.....Latest date for filing applications for masters' degrees to be conferred in February.
Jan. 15, Monday.....Latest date for candidates for Ph.D. degree in February to deposit theses.
Jan. 22, Monday.....Semester examinations begin.

1940

Jan. 26, Friday.....Examination in French.

Jan. 29, Monday.....Latest date for candidates for masters' degrees in February to deposit theses.

Jan. 30, Tuesday.....Semester examinations end.

Feb. 1, Thursday.....Latest date for Ph.D. finals for degree in February.

Feb. 2, Friday.....Examination in German.

Second Semester

Feb. 2, 3, Friday, Saturday.....Registration days.

Feb. 3, Saturday.....Latest date for registration of former students without penalty.

Feb. 7, Wednesday, 8 A.M.....Instruction begins.

Feb. 15, Thursday.....Latest regular date for applications for scholarships and fellowships for 1940-1941.

Feb. 24, Saturday, 12 M.....Latest date for changing study-lists without fee.

Feb. 29, Thursday.....Latest date for preliminary examinations (for full residence).

March 22, Friday, 8 A.M.....Easter recess begins.

March 26, Tuesday, 8 A.M.....Easter recess ends.

April 1, Monday.....Latest date for filing applications for masters' degrees to be conferred in June.

April 13, Saturday.....Latest date for registering for French and German examinations.

April 26, Friday.....Examination in French.

May 1, Wednesday.....Latest date for candidates for professional engineering degrees to deposit theses.

May 3, Friday.....Examination in German.

May 13, Monday.....Latest date for candidates for Ph.D. degree in June to deposit theses.

May 15, Wednesday.....Latest date for filing applications for masters' degrees to be conferred in August.

May 15, Wednesday.....Pre-registration for masters' degrees to be conferred in August.

May 24, Friday.....Semester examinations begin.

May 27, Monday.....Latest date for candidates for masters' degrees in June to deposit theses.

May 27, Monday.....Latest date for Ph.D. finals.

May 30, Thursday.....Memorial Day.

June 3, Monday.....Semester examinations end.

June 10, Monday.....Sixty-ninth Annual Commencement.

Notes

Examination in one foreign language must be passed before residence on second year may be counted (pp. 13, 16).

Two copies of thesis are required of candidates for masters' and doctors' degrees (pp. 13, 17).

Candidates for masters' degrees announce thesis subjects at beginning of second half-year of work, or after completion of four units, or at beginning of third summer session (p. 13).

Candidates for Ph.D. degree announce thesis subjects within six weeks after beginning of third year of residence (p. 17).

Candidates for Ph.D. degree deposit theses two weeks before date of final examination (p. 17).

HEADS AND CHAIRMEN OF DEPARTMENTS GIVING GRADUATE WORK

Accountancy	Hiram Thompson Scovill
*Agricultural Economics	Harold Clayton M. Case
Agronomy	William Leonidas Burlison
Animal Husbandry	William Ernest Carroll
*Architecture (and Architectural Engineering)	Loring Harvey Provine
*Astronomy	Robert Horace Baker
Bacteriology	Fred Wilbur Tanner
Botany	John Theodore Buchholz
*Business Organization and Operation	Hiram Thompson Scovill
Ceramic Engineering	Cullen Warner Parmelee
Chemistry	Roger Adams
Civil Engineering	Whitney Clark Huntington
Classics	William Abbott Oldfather
Dairy Husbandry	Harrison August Ruehe
Economics	Merlin Harold Hunter
Education	Thomas Eliot Benner
Electrical Engineering	Ellery Burton Paine
English	Harold Newcomb Hillebrand
Entomology	Clell Lee Metcalf
French	Joseph Francis Jackson
Geology and *Geography	Frank Walbridge DeWolf
German	Albert William Aron
History	William Spence Robertson
*Home Economics	J. Lita Bane
Horticulture	John William Lloyd
*Library Science	Phineas Lawrence Windsor
Mathematics	Arthur Byron Coble
Mechanical Engineering	Oscar Adolph Leutwiler
Mining Engineering	
*Music	Frederic Benjamin Stiven
Philosophy	Arthur Edward Murphy
*Physical Education	Seward Charle Staley
Physics	Francis Wheeler Loomis
*Physiology	Frederic Russell Steggerda (Secretary)
Political Science	John Archibald Fairlie
Psychology	Herbert Woodrow
Railway Engineering	Edward Charles Schmidt
Sociology	John William Albig (Secretary)
Spanish and Italian	John Van Horne
Theoretical and Applied Mechanics	Fred B. Seely
Zoology	Victor Ernest Shelford

*Give work for masters' degrees only.

THE GRADUATE SCHOOL

History and Organization

The University of Illinois offered facilities for advanced study and research in various lines as early as 1872. Organized graduate instruction, however, under the name of the Graduate School, was first undertaken in 1892. In 1894 the administration of the school was vested in the Council of Administration, and the Vice-President of the University became Dean of the School. In 1906 the Graduate School was organized as a separate faculty.

By action of the Trustees the teaching faculty of the Graduate School includes all members of the University Faculty who give instruction in approved graduate courses. The affairs of the School, however, are in charge of the Executive Faculty.

Admission

Admission to the Graduate School may be granted to graduates of institutions whose requirements for the bachelor's degree are substantially equivalent to those of the University of Illinois and to applicants from other institutions approved by the Executive Faculty, as hereinafter provided. *Admission to the Graduate School does not, however, imply admission to candidacy for an advanced degree, and gives no right or claim to be so admitted. A mere accumulation of "credits" or "grades" is not sufficient.*

A graduate of an independent conservatory or school of music will be considered for admission to graduate work in music under the following conditions: (1) The degree must be based on a four-year curriculum in music. (2) The undergraduate work presented for the degree must include not less than 18 hours (30 hours for Music Education curriculum) in academic subjects, with not less than the equivalent of two years of college work in foreign languages, one year of which must be in French or German completed in college. (3) The applicant must pass a qualifying examination in the branch of music which he wishes to pursue as his major field in graduate study, given under the supervision of the Director of the School of Music.

Admission to graduate courses may be granted only to those who have had the requisite undergraduate work in those courses or departments; students whose preparation is considered inadequate may be required to take without credit certain undergraduate courses. But a student of mature age who satisfies the Dean and the department concerned of his ability to pursue graduate work in a given line may be enrolled in particular graduate courses, without reference to a degree, and permitted to carry on such study or investigation under the direction of a department of the University as the department shall recommend and the Dean approve.

Application blanks for admission may be secured from the Registrar of the University. Every applicant must submit with his application for admission an official transcript of his college record. All students, except those entering only for summer sessions, who have not previously taken a physical examination at the University, must take such an examination. The examination is given by the University Health Service without cost to the student, if taken at the time of appointment during the registration period.

Character of Graduate Work

The principal aim of graduate study is the development of the power of independent work and the promotion of the spirit of research. Each candidate for a degree is expected to have a wide knowledge of his subject and of related fields of work. The graduate student is not expected to get from lecture and laboratory courses all the knowledge and training necessary to meet the requirements for his degree.

Registration and Program of Study

The following regulations concerning registration and program of studies are laid out primarily for first-year students. Second-year and third-year graduate students fill out their programs irrespective of the unit value of courses, according to their needs, under the advice of their instructors.

Registration.—Each graduate student must register at the beginning of each semester. The registration of a new student may be accepted at any time provided the student is prepared to take up courses actually under way. Credit towards the fulfillment of the residence requirement dates, however, from the time of registration and not from the beginning of the semester or year in which the student enters.

A new student must fill out in duplicate an application for admission and submit it to the Registrar, from whom, after the approval of his application, he will receive a card of admission and a study-list which will give details of procedure in registering. He should fill out the study-list after consultation with his adviser, or the person in charge of his major work, and also with the instructors whose courses he wishes to elect. *Registration, including the payment of fees, must be completed by the close of the registration days of the Graduate School. Otherwise a fee of $5.00 for late registration will be charged all former students of the University of Illinois.*

Changes in Study-lists.—A graduate student is expected to plan his work so carefully that changes in his study-list during the semester will not be necessary. When a change seems advisable, however, it may be permitted without fee if made within three weeks of the date of registration. After that date a fee of one dollar is charged for each change, except that the total charge for rearrangement authorized on any one change slip shall not exceed two dollars.

Advanced Undergraduate Courses Open to Graduate Students.—The amount of graduate credit appropriate to these courses ranges from one-fourth to one unit. In the more elementary courses it should not exceed one-half unit. The actual amount in each case should be specified on the student's program by the department concerned, and is subject to approval by the Dean. Courses which are regularly open to sophomores may not be taken for graduate credit.

Seniors and Graduate Study.—If at the beginning of the second semester of his senior year a student who has been in residence at least one year is within five hours of a bachelor's degree, he may be permitted to register for courses which may count for residence for a master's degree, provided his program is limited to approximately twelve formal class, lecture, or laboratory exercises a week, and is approved by the Dean at the time of registration. Only students of excellent record will be allowed this privilege.

Miscellaneous and Listeners' Courses.—A graduate student in full stand-

ing and carrying a minimum program, may be permitted, under proper circumstances, to elect one miscellaneous subject (that is, a course which does not count towards an advanced degree). No subject is open as a miscellaneous course unless it has a specific educational bearing on the student's major or minor subjects of study. A student who elects a miscellaneous course is required to register in it, do the work, and pass the semester examinations, unless he is permitted to withdraw under the rules.

Graduate students are permitted to attend classes as listeners, providing a card bearing the approval of the adviser and instructor is filed at the Graduate School office. A student who attends as a listener is not permitted to participate in the class work or the examination.

No student may register for a full minimum program of work for graduate credit if it is necessary for him to carry at the same time more than one miscellaneous subject.

Students on the Staff.—Assistants and others on the university staff who undertake to do graduate work are permitted to take an amount of work determined by the terms of their employment. Such a student, if required by his engagements to teach more than five classes a week or to have laboratory work or supervision exceeding ten hours a week, will find it impossible to complete the work for the master's degree in one year, or the doctor's degree in three years.

Residence and Work Done Elsewhere.—Continuous residence and study are required of all members of the Graduate School, unless they are granted leave of absence by the Dean, upon recommendation of the professor in charge of their work, for the purpose of carrying on elsewhere studies or investigation in the line of work for their degrees.

Graduate Study in the Summer.—Graduate students in the summer session are subject to the same scholastic requirements as those in the regular university year. Their study-lists must be approved by the Dean of the Graduate School, or his representative. Two to two and one-half units of graduate work may be taken in the summer session. Two units is considered a full minimum program for the summer. Attendance during four out of six consecutive summer sessions, or one semester and two summer sessions, is considered the equivalent of one year in residence. No course offered in the summer session may be taken for credit towards a higher degree unless it is described in the summer session circular as accepted for that purpose.

The Executive Faculty may, at the request of a given department, accord recognition to its summer session work subject to the following conditions: (1) Study in the University of Illinois summer session may be counted in partial fulfillment of the residence requirements for the degree of Doctor of Philosophy, but at least one continuous academic year of residence at the University at some time during the second or third years of the doctoral program is required. (2) Persons electing to use this plan shall be required to submit a schedule of study covering the second and third years of work toward the doctorate. This schedule of study must be approved by the adviser in charge of the major subject and by the Dean of the Graduate School. (3) Apart from the provisions stated above, the present practices and standards of the Graduate School relating to the doctorate shall be continued.

Graduate Work in Medical and Dental Sciences.—Graduate courses in medical and dental sciences are offered in the Colleges of Medicine and Dentistry of the University of Illinois, and summer courses are offered in the College of Medicine. Circulars describing the courses offered and conditions of admission and work may be obtained from the Committee on Graduate Work in the College of Medicine, 1853 West Polk Street, Chicago.

Failures.—A graduate student who fails in any course in his major subject cannot secure his degree in the same year in which the failure occurred. No condition examinations are given graduate students.

Withdrawal.—If after registration a graduate student wishes to withdraw from any course or to add other work, he must first secure the necessary papers from the Dean's office. See the regulations concerning changes in study-lists, page 10. If he wishes to withdraw from the University he must get clearance papers at the Dean's office.

Masters' Degrees

Character of Masters' Degrees.—The master's degree conferred depends upon the character of the bachelor's degree. The usual practice is that A.M. shall follow A.B., and that M.S. shall follow B.S. However, this practice may be departed from in cases where the undergraduate course of study of the candidate was of a kind for which some reputable institutions in this country give A.B., while others give B.S. In Music the M.Mus. shall follow the B.Mus., and the M.S. in Music Education shall follow the B.S. in Music Education.

Amount of Work Required.—Candidates for the degree of Master of Arts or Master of Science are required to do at least one full year's work in residence, usually including a thesis. Four to five units constitute a normal semester program for the master's degree. A minimum of eight units must be completed for the degree. Only first-rate students are permitted to secure a degree with this minimum program. In some departments special examinations are required of candidates for masters' degrees. In all cases the student must satisfy the duly approved conditions set by his major and minor departments.

Unless otherwise permitted, every student must take each semester at least one course open to graduate students only (courses numbered 100 and upwards).

In the first year of his graduate study each student is required to attend a minimum of four formal class, lecture, or laboratory exercises a week. Schedules involving an unusually large number of formal class meetings per week will require the special approval of the Dean.

Work Done Elsewhere.—Members of the staff and high school teachers residing and employed in Urbana or Champaign who have done graduate work in approved institutions elsewhere may secure credit not to exceed four units towards the master's degree by passing examinations in that work. They may complete the work for the degree by securing at least four units more while registered in the Graduate School for not less than one academic year.

Graduate students who have been in residence one semester or its equivalent may offer for credit not more than nine weeks of work at a marine or fresh-water biological laboratory or in biological or geological field work, on condition that the work be of graduate grade under a qualified instructor or director as certified by the student's major adviser and approved by the Dean of the Gradu-

ate School; that approval be obtained by the student in advance; and that a written report of the work accomplished be presented by the student and approved as satisfactory by the student's major adviser.

Majors and Minors.—A candidate for a master's degree may do all his work in one subject, or he may select a major and one minor, or a major and two minors. A major or minor denotes the field of knowledge of a department, or such part thereof as constitutes a separate and independent division of that field. For a master's degree a major is at least half the work, or a minimum of four units, for one year. Less than one unit may not be counted as satisfying the requirements of a minor without the approval of the department concerned.

Foreign Language.—The ability to use one or more of the modern languages ordinarily studied in the undergraduate curriculum is desirable for all candidates for the master's degree, and in some lines of study is required. No student will be permitted to acquire residence toward the second year for the doctorate until he has passed the preliminary examination in at least one of these languages.

Masters' Theses.—Each candidate for a master's degree is required to present two copies of a thesis on some subject approved by the professor in charge of his major work. Such approval, except in case of students working for masters' degrees in summer sessions only, must be secured and the subject of the thesis filed at the office of the Graduate School not later than the beginning of the second half-year of residence. Students working for masters' degrees exclusively in summer sessions must announce their thesis subjects not later than the beginning of their third session in residence. The requirement of a thesis may be waived, however, on the recommendation of the professor in charge of his major work and the approval of the Dean, *provided application to waive the thesis is made at the time for announcing thesis subjects.* A student excused from writing a thesis must replace it with courses of instruction.

No one will be excused from writing a thesis unless one-half of his program of studies consists of courses numbered 100 and upwards.

The thesis required from a candidate for a master's degree will ordinarily demand from one to two units of work, and may not exceed three units except by special permission. The thesis must be typewritten, on "thesis paper,"[1] and the title page must be printed. The carbon copy may be on plain paper of approximately the same weight as the thesis paper. Both copies of the thesis in its final form, together with a certificate of approval by the proper officer, must be left at the Dean's office at least two weeks before the date on which the degree is to be conferred. No article prepared for another use, or previously published, will be accepted as a thesis.

Permission for the publication of the material of a master's thesis should be obtained from the Dean of the Graduate School before such publication is carried out.

Applications for Degrees.—Each candidate for the degree of Master of Arts or Master of Science or Master of Music shall file an application for the degree on a blank provided for the purpose, to be had at the Dean's office. For the dates of applications and of deposition of theses, consult the calendar at the beginning of the bulletin.

Degrees in August.—Students who expect to become candidates for the

[1]No other will be accepted by the Dean. "Instructions for the Preparation of Theses" may be obtained at the Dean's office.

master's degree in August may be recommended at the June meeting of the Senate subject to the successful completion of the work for which they are to register in the summer session. However, in order to avail themselves of this privilege, students must file with the Dean before the June meeting of the Senate an exact statement of the work necessary to complete the requirements for the degree. Blanks for this purpose may be secured at the Dean's office. For the dates of filing application and pre-registration blanks, consult the calendar at the beginning of the bulletin.

Thesis Work on Leave of Absence.—Under proper conditions a student may be permitted to complete the last fourth of his work, if devoted to his thesis, under leave of absence for a period not to exceed the equivalent of two semesters. To get such permission the student must have secured credit for at least six units; must petition for the privilege; must submit to the Dean an outline of the proposed investigation, approved by the professor in charge of his major work, and must submit satisfactory evidence that adequate facilities are available to him at the place where he intends to do the proposed work. Approval on all these points must be obtained one collegiate year before the thesis is due. Immediately following approval the student must register and pay an incidental fee of $20.00.

Grades.—Students' work is graded in five classes, A, B, C, D, and E. The last indicates a failure. D indicates unsatisfactory, though passable, work.

A student who receives two units of a grade below B during his first year of graduate work may not complete the first year of residence by carrying the minimum program of eight units for the master's degree. Three units of a grade below B disqualify a student as a candidate for a degree.

A failure or absence from examination in any course or failure in any other examination prescribed by the department of the major may prevent the conferring of the degree; and, as already indicated, failure in any course in the major field precludes the conferring of the degree in the same year.

Master of Business Administration

(See page 32 for description.)

Master of Music and Master of Science in Music Education

(See page 68 for description.)

Second Degrees in Engineering

Two classes of second degrees are open to graduates of the College of Engineering, namely, academic and professional.

The *academic* second degree in engineering is Master of Science, following Bachelor of Science, in civil engineering, electrical engineering, etc. This degree is conferred in accordance with the regulations described above for *academic work in residence only.*

The *professional* second degrees in engineering are as follows:

Master of Architecture, after B.S. in architecture.

Architectural Engineer, after B.S. in architectural engineering.

Ceramic Engineer, after B.S. in ceramic engineering.

Chemical Engineer, after B.S. in chemical engineering.

Civil Engineer, after B.S. in civil engineering or in railway civil engineering.

Electrical Engineer, after B.S. in electrical engineering or in railway electrical engineering.

Mechanical Engineer, after B.S. in mechanical engineering or in railway mechanical engineering.

Engineer of Mines, after B.S. in mining engineering.

Engineer-Physicist, after B.S. in engineering physics.

Professional degrees in engineering may be conferred on two classes of candidates: (1) those who have received an academic degree in engineering from the University of Illinois; (2) those who have received an academic degree in engineering[1] from other institutions of equal standing and who have been members of the teaching or research staff of the College of Engineering or Engineering Experiment Station or the Department of Chemistry of the University of Illinois for at least three years prior to the conferring of the professional degree.

A candidate declares his candidacy by filing with the Dean of the College of Engineering, as chairman of the committee in charge, a detailed statement covering his professional engineering experience. This statement must be made upon a standard form supplied by the Dean of the College of Engineering, as chairman of the committee in charge, and must be filed not later than the first Monday in November preceding the commencement at which the candidate expects to receive the degree. No statement of experience will be considered by the committee which does not show that the candidate has had a minimum of four years of acceptable engineering experience after receiving the degree of Bachelor of Science, and that for at least three years he has been in responsible charge of engineering work. Responsible charge in engineering teaching may be considered as responsible charge of work. In determining the acceptability of the engineering experience of the candidate the committee will be guided by the character of his professional work and the degree of responsibility involved, and will take into consideration such evidences of professional ability and growth as may be shown by his investigation of engineering problems, his contributions to technical literature, and his membership and activity in engineering societies.

If the professional experience of the candidate is accepted he must submit for approval, prior to December 31, an outline of his proposed thesis. The completed thesis, in the form prescribed in the "Instructions for the Preparation of Masters' and Doctors' Theses," must be deposited with the Dean of the College of Engineering not later than May 1. The candidate must present himself at commencement in order to receive the degree.

A candidate for a professional engineering degree must pay the incidental fee of twenty-five dollars on being notified that his professional experience is accepted as qualifying him to enter as a candidate for the degree. No one will be enrolled as a candidate for the degree at the following commencement who does not pay his fee at this time. When a candidate for a professional engineering degree has once been accepted and paid his fee, he is eligible to receive the degree at any time within five years, without additional fee, on completion of the requirements; provided, however, that unless he completes the requirements within two years his name will be dropped from the list of candidates and in order to receive the degree within the five-year period he must register once more.

[1]Including chemical engineering.

The Degree of Doctor of Philosophy

Major and Minor Subjects.—A member of the Graduate School who desires to become a candidate for the degree of Doctor of Philosophy is required to pursue a major subject in the department in which his research lies. He is also required to choose one minor subject, or he may choose two. If one minor only is chosen it must be taken in a department of study other than that of the major, and credit for it may be earned by work representing not less than four units, or one-sixth of the total residence required for the doctorate. If two minors are chosen, one must be a subject closely related to the major. With the approval of the adviser and the Dean it may be a division of the major field of study. The other minor (not less than two units) must, in that case, be taken in a department of study other than that of the major.

Except by special permission of the Dean the preliminary examination in major and minor subjects may not be taken until the minor work has been done.

Method of Computing Residence.—Credit for a full year of graduate work means that the student has during that time devoted all his working time and energy to study of a graduate grade. After the first year of residence, credit is not recorded in units, and there is no fixed correspondence between credit and courses as in undergraduate work.

Period of Study.—The normal *minimum* period of study required for securing the degree of Doctor of Philosophy is three years, during which the student is required to devote all his working time to his studies. All three years must be spent in resident graduate study at some accredited educational institution and either the first two or the last one of the three must be spent at the University of Illinois. The degree is conferred, however, not for residence during a certain period, but for scholarly attainments and power of investigation, as proved by a thesis and examinations. For study in summer sessions, see page 11.

Work Done in Other Universities.—Credit for graduate work done in other universities is not "transferred." However, it may be accepted on examination as equivalent to resident work at the University of Illinois, provided the institution in which it was done is of high standing.

Preliminary Examinations.—

A. In Languages.—The student will be required to demonstrate his ability to read French and German and other languages needed in his work. (In special cases the Executive Faculty, upon recommendation of the student's adviser, may substitute for either one of the languages usually required some other language which can be shown to be more useful in that student's professional research.) No student will be permitted to acquire residence towards the second year of graduate study until he has passed the examination in at least one of these languages. Both the examination in French and that in German must be passed before the student is admitted to the preliminary examination in his major and minor subjects. For the dates of these language examinations consult the calendar at the beginning of this bulletin. See calendar for date when application for admission to these examinations must be made.

B. In Major and Minors.—Towards the end of his second year of study, or by special permission, at the beginning of his third year (not later than about October 15), a student who wishes to become a candidate for the degree must submit to a preliminary examination conducted by a committee appointed by the

Dean. This examination is intended to test the student's knowledge of the fields of his major and minor subjects of study and to determine whether he is prepared for the final year of work for the doctorate. It is partly oral, and may be wholly so.

The student will not be admitted to his preliminary examination until the faculty is satisfied that he has finished substantially the equivalent of two years' graduate work. He must do a full year's graduate work between his preliminary examination and the completion of his work for the doctorate.

Final Examination.—At least two weeks before the time when the degree is conferred, the candidate must submit to a final examination, given by a committee appointed by the Dean. This examination is primarily on the research work of the student, as embodied in his thesis, but it is not confined to that. It extends to the whole field of study of the candidate. It will not be confined to the courses which the candidate has attended in the University of Illinois only, if he has done part of the work elsewhere; nor even to the field covered by the courses specifically taken in this or other universities; but will be so conducted as to determine whether the candidate has a satisfactory grasp of his major subject as a whole, and a general acquaintance with the fields of knowledge represented by his course of study.

The final examination may not be divided. The examination must be taken all at one time even though it requires several sessions.

If after having passed his preliminary examination, he fails in the third year of his study to meet the expectations of the professors in charge of his work, or in any way fails to maintain the standard of scholarship and power of research expected of him, he may be refused admission to the final examination.

Other Examinations.—Before the candidate is admitted to the final examination and the defense of his thesis, he may be required to take any other examination, oral or written, that is thought proper by the various departments in which he has studied.

The above examinations are in addition to those in the courses for which the student is registered. These must be taken at the time for which they are set in the examination schedule.

Thesis.—The power of independent research must be shown by the production of a thesis on some topic connected with the major subject of study. The candidate is expected to defend his thesis or dissertation before the members of the faculty, or as many of them as may wish to question him about it, in connection with his final examination.

The subject of the thesis should be chosen not later than the end of the second year of residence and must be submitted for formal approval by the faculty not later than six weeks from the beginning of his third year of residence.

Two typewritten copies of the complete thesis, *the original on thesis paper,*[1] and the first carbon on plain paper of approximately the same weight, and in final form, must be deposited in the office of the Dean for presentation to the examining committee not later than two weeks prior to the final examination and not less than four weeks before the time when the degree is conferred. At the same time, the candidate must deposit with the Dean a manuscript of the

[1]No other will be accepted by the Dean.

essential part, or an abstract, or a digest of his thesis, in condition for publication at a cost not to exceed seventy-five dollars ($75). The manuscript must be sufficient to show the method followed, the evidence used, and the conclusions reached in the investigation, and must bear the approval of the department and the Executive Faculty of the Graduate School.

The candidate must pay to the Comptroller before graduation the sum of seventy-five dollars ($75) out of which the University will print at least one hundred copies of this manuscript for circulation by the University, unless the thesis entire or in abbreviated form is published by the author or is accepted for publication by a standard journal or publisher within a year from the date of graduation. In the latter event, and after one hundred copies have been presented to the University by the writer, the cash deposit shall be returned to him.

The typewritten and printed forms of the thesis must comply with the regulations given in "Instructions for the Preparation of Masters' and Doctors' Theses," copies of which may be obtained at the Dean's office.

Degree of Doctor of Philosophy in Engineering

The degree of Doctor of Philosophy in Engineering is offered in certain lines of academic work of a high scholastic type in engineering science for students who wish to prepare themselves as teachers, investigators, and experts.

The general requirements for this degree, as to preliminary education, linguistic attainments, etc., are the same as in other subjects.

The following lines of engineering science, or others approved by the Graduate School, may be elected as majors:

Engineering mechanics
Steam engineering
Hydraulic and sanitary engineering
Electrical engineering
Heating and ventilation engineering
Railway engineering
Masonry construction and structural engineering
Coal-mining engineering
Ceramic engineering
Chemical engineering

The first minor may be any of the above or one of the following sciences or an authorized combination of two of them:

Theoretical mechanics
Mathematics
Thermodynamics
Bacteriology
Chemistry
Geology
Physics (experimental or mathematical)
Zoology
Botany
Economics

The second minor should be in other than engineering subjects.

Agricultural and Engineering Experiment Stations

Attention is called to the unusual opportunities for graduate study in connection with the Agricultural and Engineering Experiment Stations. By undertaking a line of graduate study in close association with some one of the projects carried on in those Stations, the student will come into contact with aspects of his specialty which he would rarely touch in a purely academic study, and he will thus broaden his outlook. The Experiment Stations make available apparatus, equipment, and the services of mechanicians, which may materially facilitate the carrying on of investigations.

Scholarships and Fellowships

A number of scholarships and fellowships have been established by the Trustees of the University open to candidates who are not over thirty years of age at the time when the appointment is to be made. To first-year graduate students of ability and promise there are open a number of scholarships with stipends of $300 and carrying exemption from the payment of tuition, incidental, and laboratory fees. There are two classes of fellowships—University Fellowships and Honorary Fellowships. The first are open to second-year and third-year graduate students with stipends of $500 and $600, respectively. To be eligible for a $600 fellowship an applicant must have passed both language examinations before the date for filing applications and must be prepared to take the preliminary examination in his major and minor subjects by the following June. Honorary Fellowships carry no stipends and no exemption from the payment of fees. Their purpose is to give recognition to superior students who are not in need of financial assistance.

Candidates for these scholarships and fellowships must be graduates of the University of Illinois, or of colleges or universities having equivalent requirements for bachelors' degrees.

Application must be made on blanks to be obtained from the Dean of the Graduate School. These application forms should be sent to the Dean of the Graduate School as early as possible in February of the academic year preceding that for which the fellowship is desired. No application will be considered if received later than February fifteenth, until after April fifteenth, the date when appointees from the first list of applications must accept or refuse their appointments.

Persons appointed are notified on April first and must send the Secretary of the Board of Trustees notice of their acceptance or refusal by April fifteenth; and must agree that, if accepted, the appointment will not be resigned to take a similar one in any other institution during the year for which it is awarded.

Nominations to fellowships are made on the grounds of worthiness of character, scholastic attainments, and promise of success in the principal line of study or research to which the candidate proposes to devote himself.

Research Graduate Assistantships in the Engineering Experiment Station

The Engineering Experiment Station is devoted to the study of problems of special importance to engineering and to manufacturing, railway, mining, and industrial interests, and the stimulation and elevation of engineering educa-

tion. Approximately fourteen research graduate assistantships with a nominal stipend have been established, open to graduates of approved technical schools and universities. Applicants to whom these graduate assistantships are awarded agree to hold them for two years, devoting one-half their time to the work of the Engineering Experiment Station. At the end of this period, if all requirements have been met, the degree of Master of Science will be conferred. Several additional assistantships are usually maintained by industrial organizations. Applications for graduate assistantships should be made to the Director of the Engineering Experiment Station not later than March 1.

Libraries

The general university library, including the departmental libraries and reading rooms listed below, is located at the University in Urbana. The libraries of the College of Pharmacy and the College of Medicine are in Chicago.

These libraries contain about 1,168,000 volumes and about 320,000 pamphlets. Of these, 1,110,000 books and 300,000 pamphlets are in the libraries at Urbana; the rest are in Chicago. The library at Urbana also contains about 3,800 maps and 10,600 pieces of sheet music. Over 8,000 periodicals are currently received, including over 200 newspapers published in Illinois and about 125 foreign language newspapers published in the United States.

The general library of the University is open daily, from 8 a. m. until 10 p. m. and on Sunday from 2:30 p. m. until 5:30 p. m.

In the book stacks are 140 cubicles for the use of faculty members and graduate students.

A number of departmental and college libraries and reading rooms are maintained in the library and in other buildings on the campus; these libraries do not necessarily contain all the books in the respective subjects. In some instances they are primarily for the use of the graduate students and advanced undergraduate students in the departments using the respective buildings. The principal departmental libraries and reading rooms are the following:

Name of Library	*Location*	*Volumes*
Philosophy, Psychology, and Education	Library Building	7,600
Classics	Library Building	26,000
Modern Languages	Library Building	9,000
English	Library Building	6,800
Seventeenth Century Book Room	Library Building	7,400
History and Political Science	Library Building	14,000
Economics, Sociology, and Commerce	Library Building	4,700
Natural History	Natural History Building	59,600
Law	Law Building	60,000
Architecture, Ricker Library of	Architecture Building	14,300
Agriculture	New Agriculture Building	26,700
Chemistry	Noyes Chemistry Laboratory	16,400
Physics	Physics Building	1,600
Mathematics	Mathematics Building	12,900
Engineering	Engineering Hall	40,000
Landscape Architecture	New Agriculture Building	7,000

The library includes most of the bibliographical aids published for the book-trade in this and other countries; a Union Card Catalog numbering over 2,750,000 cards, chiefly of books in seven other large American libraries; many printed catalogs of important libraries, e.g., Catalogue of Printed Books in the British Museum, Gesamtkatalog der Preussischen Bibliotheken, and Catalogue Général des livres imprimés de la Bibliothèque Nationale; and many bibliographies of special subjects.

The following brief statements indicate the resources of the library for research in a few subjects selected at random:

Official publications of municipalities number about 32,500 reports, charters, and ordinances, issued by over 3,000 American and 300 foreign municipalities, and more or less complete files of about 50 municipal periodicals. Systematic attempts are made to secure current publications, especially of Illinois municipalities.

Mathematics numbers 12,900 volumes, about 9,500 dissertations and other pamphlets, and includes files of over 300 periodicals and other serials.

Chemistry includes about 11,500 volumes of bound periodicals, 4,900 other books, 1,500 pamphlets, 7,200 theses, and receives currently 255 journals, most of which are complete sets.

Italian history includes the Cavagna Library, 40,000 volumes, pamphlets, and maps, and 138 bundles of manuscripts with typed partial index to families and places dealt with; much material of Italian local history, biography, and genealogy.

Classical literature, history, and archaeology embraces approximately 30,000 volumes, including complete sets of about 150 journals and serials; the library of Professor Wilhelm Dittenberger, of Halle, 5,600 items acquired in 1907; the library of Professor Johannes Vahlen, of Berlin, 10,000 items acquired in 1913; and a collection of about 17,000 dissertations, reprints, etc.

The Ricker Library of Architecture numbers 14,300 volumes, 15,300 lantern slides, and 9,000 photographs and drawings. It is not only a good working library for faculty and students in architecture, but contains many of the older and rarer works.

The Seventeenth Century Book Room houses about 7,400 volumes, including the Milton collection of approximately 1,500 volumes, and other titles relating to the literary, political, and religious life of seventeenth century England, especially the Milton period.

The newspaper collection contains 15,700 bound volumes of general newspapers. Included in it are files of 220 newspapers published in Illinois, generally complete since 1912, and 135 foreign language newspapers published in this country, generally complete since 1916. In the latter group are newspapers in 30 different languages.

Music embraces over 18,000 scores and pieces of music, over 4,200 books on music, definitive complete works of most major composers, many complete files of foreign and domestic journals.

Fees and Expenses

Except as noted below, graduate students pay fees as follows:

Matriculation fee	$10.00
Incidental fee, each semester, for residents of Illinois	35.00
All students, not residents of Illinois, pay each semester an incidental fee of	62.50
Incidental fee for students registered for thesis work towards the master's degree on leave of absence	20.00
Graduation fee	10.00
For late registration	5.00
For change in study-list	1.00

Persons on University appointment at a salary of $1,600 per year or less, eligible for admission to University work, or on scholarship or fellowship appointment in the Graduate School are exempt from the payment of incidental and laboratory fees in courses counting for graduate credit. Course fees indicated in paragraphs (a) or (b) or (c) below and laboratory fees are required for courses not counting for graduate credit.

On approval of the dean of the college concerned, persons may register for reduced schedules. Such persons pay the matriculation fee and the usual laboratory fees. Under the following provisions they pay the course fees indicated in lieu of the regular incidental fee:

(a) For undergraduate and professional work in the colleges and schools at Urbana: $2.50 per credit hour, provided registration is for not more than eight semester hours.

(b) For undergraduate work in the College of Pharmacy: $5.00 per credit hour for residents of Illinois, or $7.50 per credit hour for non-residents of Illinois, provided registration is for less than ten semester hours.

(c) For undergraduate work in the Colleges of Medicine and Dentistry: First-year and second-year courses, 25 cents per clock hour, plus regular laboratory fees in the courses for which the student registers; third-year and fourth-year courses, 20 cents per clock hour plus full laboratory fees and an additional 15 cents per clock hour for courses involving dispensary or infirmary fees. Non-Illinois students registered for partial programs pay one and one-half times the above stated clock hour fees, except for dispensary and infirmary.

(d) For graduate work at Urbana or Chicago: At the rate of $10.00 per unit, provided registration is for not more than two units.

All persons shall pay the matriculation and graduation fees.

Table board may be obtained at prices ranging from $5 to $7 a week.

Room rent, single room, ranges from $15 to $25 a month; double room, from $10 to $15 a month, each person.

DEPARTMENTS OF INSTRUCTION

Courses open to graduate students are of two classes. The first class is wholly of graduate grade, and the courses are numbered 100 upwards. The second class includes the courses classified as for graduates and advanced undergraduates. These carry numbers below 100. The courses numbered 100 and upwards are all accepted for major credit. Those of the other group are in many cases accepted for minor credit only. This is especially true of courses which are open to juniors.

All courses have certain prerequisites for admission. Inasmuch as the prerequisite preparation may be gained at other institutions from courses differing from those offering a similar preparation at the University of Illinois, so that a statement of prerequisites as given here would not be understood elsewhere, their description is omitted altogether. However, a student who wishes to enter a particular course must satisfy the department concerned that he has had in some form the prerequisites for admission to the course.

For the convenience of first-year students the credit value of graduate courses is given in units. These values have no significance for second-year and third-year students.

The credit received for "courses for graduates and advanced undergraduates" is in accordance with the regulations of the Graduate School (see page 10).

Students are admitted to graduate standing in agriculture who have had a thorough training in the sciences underlying agriculture, and who are otherwise eligible to the Graduate School, even though their undergraduate course of study lacked to some extent the amount and kind of technical work in agriculture included in the course of study for the bachelor's degree in agriculture at the University of Illinois.

AGRICULTURAL ECONOMICS

Graduate students in agricultural economics may do their work in the general field of agricultural economics or specialize in any one of the following: (1) farm organization and management; (2) land economics; (3) agricultural marketing; and (4) agricultural prices and statistics.

Graduate work in agricultural economics as a major subject is open to students under either of two conditions: (1) the student must have done at least 20 hours of undergraduate work in economics, agricultural economics, business organization and operation, accountancy, history, political science, or sociology, of which at least 12 hours must have been in the field of economics and agricultural economics; or (2) the student must have had a thorough training in the principles of agricultural economics consisting of at least 12 hours credit in economics and agricultural economics, either in connection with or in addition to a course of study in agriculture substantially equivalent to that required for the bachelor's degree in agriculture in this University.

To take agricultural economics as a minor, the student must have had at least 20 hours work in agricultural and economic subjects. Two units in agricultural economics will be accepted as satisfying this requirement.

Graduate students who are making agricultural economics their major are

required to take at least one course in advanced economic theory. Where such students are taking two minors in other departments, one of them must be in economics, business organization and operation, accountancy, sociology, history, or political science.

Certain courses given in other departments are closely related to those in agricultural economics. A graduate student whose major is in agricultural economics may be permitted, on approval of the departments concerned, to take such courses as part of his major work. Attention is called to graduate courses in economics, accountancy, business organization and operation, and sociology, as well as those in other departments in the College of Agriculture.

Courses for Graduates

103. Personnel Relationships in Teaching, Research, and Extension Work.—See Animal Husbandry 103 and Agronomy 119. (Not given in 1939-1940.)

109. Seminar. Thesis Course.—All graduate students whose major is agricultural economics must register in Agricultural Economics 109; credit is conditional upon the completion of an acceptable thesis. Once a week; both semesters. *One to two units.* Members of the department.

110. Theory of Agricultural Economics.—Twice a week; both semesters. *One unit.* Professor Stewart.

111. Agricultural Prices and Statistics.—Twice a week; continuous through both semesters. *One unit.* Associate Professor Working.

112. Agricultural Economics Research.—Credit is conditional upon the completion of an acceptable report of investigation. Once a week; both semesters. *One to two units.* Members of the department.

120. Farm Management Principles and Investigational Methods.—Twice a week; first semester. *One unit.* Professor Case.

135. Problems in the Marketing of Agricultural Products.—Twice a week; second semester. *One unit.* Professors Norton, Ashby, Lloyd, Associate Professor Bartlett.

Courses for Graduates and Advanced Undergraduates

10. Economic Relationships of Agriculture.—Three times a week; first semester. Professor Stewart.

11. Agricultural Prices and Statistics.—Three times a week; second semester. Associate Professor Working.

14. Cooperation in Agriculture.—Three times a week; second semester. Associate Professor Bartlett.

15. Financing Agriculture.—Three times a week; first semester. Professor Norton.

17. Economic History of Agriculture.—Twice a week; first semester. (Not given in 1939-1940.)

18. Land Economics.—Three times a week; second semester. Professor Stewart.

22. Types and Systems of Farming.—Required field trip, expense about $3. Three times a week; first semester. Associate Professor Wilcox.

25. Advanced Farm Management.—Required field trip, expense about $5. Three times a week; both semesters. Professor Case, Associate Professor Johnston.

26. Farm Administration.—Three times a week; first semester. Professor Case, Mr. Hannah.

31. Grain Grading and Marketing.—Required inspection trip, expense about $10. Three times a week; first semester. Professors Norton, Pieper.

34. Marketing Dairy Products.—Inspection trip required; estimated cost, $10. Twice a week; second semester. Associate Professor Bartlett.

36. Marketing Horticultural Products.—For seniors and graduates specializing in horticulture. Inspection trip required; estimated cost, $10. Three times a week; first semester. Professor Lloyd.

37. Marketing Livestock.—Twice a week; second semester. Professor Ashby.

42. Farm Appraisals.—Local field trips to be arranged; estimated cost, $5. Four times a week; second semester. Members of departments involved.

AGRONOMY

Graduate students may take work in agronomy leading to the M.S. and Ph.D. degrees. They may specialize for either degree in soil fertility, soil physics, soil biology, plant breeding, or crop production.

For either degree, if two minors are chosen, the first should be, and both first and second may be, taken in a department other than agronomy. If only one minor is chosen, it must be in a field outside of the department.

A candidate for the master's degree in agronomy must present an acceptable thesis, and show proficiency in his work as demonstrated by suitable examinations, prescribed by the department.

Fifteen college credits in agronomy and related subjects are prerequisites for a minor, and five additional credits are prerequisites for a major. Students must have had the fundamental work in science, prerequisite to the major and minor fields of study. Those with unusually good training in science may be permitted by the department to waive certain of the above mentioned requirements.

Courses for Graduates

101. Chemical Properties of Soils; Their Relation to Soil Development and Plant Growth.—Twice a week; first semester. *One unit.* Professor DeTurk.

104. Seminar.—Once a week; both semesters. *One-fourth unit.* The Graduate Staff.

112. Theory and Analysis of Plant Breeding Problems.—Three times a week; second semester. *One unit.* Professor Woodworth.

114. Principles Underlying the Production of Crops.—Twice a week; second semester. *One unit.* Professors Burlison, Dungan.

118. Research.—A special problem is chosen by each student. Graduate students writing theses should so indicate in registering in Agronomy 118. Both semesters. *One-half to four units.*

(a) Soils.—Professors Bauer, DeTurk, R. S. Smith, Sears.
(b) Crops.—Professors Burlison, Woodworth, Dungan, Pieper, Assistant Professor Bonnett.

119. Personnel Relationships in Teaching, Research, and Extension Work.—See Animal Husbandry 103. (Not given in 1939-1940.)

Courses for Graduates and Advanced Undergraduates

7. Crop Production as Affected by Environmental Factors.—Three times a week; first semester. Professors Burlison, Dungan.

10. Genesis, Morphology, Classification, and Geography of Soils.—Three times a week; second semester. Local field trips to be arranged; estimated expense $3. Professor R. S. Smith.
11. Rôle of Microorganisms in Soil Fertility.—Three times a week; first semester. Professor Sears.
13. Soil Productivity, its Variation, Modification, and Maintenance.—Three times a week; second semester. Professor Bauer.
14. Grain Grading and Marketing.—See Agricultural Economics 31.
22. Improvement of Farm Crops by Breeding.—Three times a week; first semester. Professor Woodworth, Assistant Professor Bonnett.
29. Principles of Field Plot Experimentation.—Three times a week; first semester. (Given in alternate years; not given in 1939-1940.) Professor Woodworth.
30. Metabolism of Soil Microorganisms.—Three times a week; second semester. (Given in 1939-1940 and in alternate years.) Professor Sears.
31. Biological Methods of Soil Investigation.—Three times a week; second semester. (Given in alternate years; not given in 1939-1940.) Professor Sears.
32. Physical Methods of Soil Investigation.—Three times a week; first semester. (Given in alternate years; not given in 1939-1940.) Dr. Stauffer.
33. Sources and Chemistry of Fertilizers and Their Soil Reactions.—Three times a week; first semester. Professor DeTurk.
35. Farm Appraisals.—See Agricultural Economics 42.

ANIMAL HUSBANDRY

The department of animal husbandry offers graduate work leading to the degree of Master of Science and the degree of Doctor of Philosophy. For a major or minor for the master's degree the student may specialize in the general field of animal production, or in the special fields of animal genetics, animal nutrition, animal pathology and poultry husbandry. For a major or minor for the doctor's degree he may specialize in animal genetics, the economics of meat production, animal nutrition, and animal pathology. Advanced work in poultry husbandry may be taken for a minor for the doctor's degree.

For registration for a minor in animal husbandry a student must offer at least 15 college credits in the field, including the principles of feeding, the principles of genetics, livestock production and livestock judging, and he must have had an introductory course in organic chemistry. For a major a student must offer at least 5 additional college credits in animal husbandry or in courses related to the major field of specialization. Besides these general requirements, a student must have had the special training required for effective graduate study in the field of his chosen major: For work in animal production, the economics of meat production; for work in poultry husbandry, an introductory course in farm management; for work in animal genetics, at least an introductory course in general zoology; for work in animal nutrition, a satisfactory course in quantitative chemical analysis, and preferably also a course in animal physiology; for work in animal pathology, training in histology, physiology, bacteriology, and hygiene. Attention is also directed to the advisability of including in undergraduate preparation for graduate work in any phase of animal husbandry at least introductory training in French or German and in mathematics.

In the case of students with an unusually thorough training in science who wish to pursue graduate work in some special field of animal husbandry from a non-agricultural viewpoint, the department may waive certain of the above requirements.

Students who desire to become candidates for the doctorate and who register for a minor in the general fields of animal production or the economics of meat production must take Animal Husbandry 7 and 41, if they have not taken these courses or their equivalents during their undergraduate training. Such students registering for a major in these general fields must take in addition Animal Husbandry 131, and most students so majoring will find it desirable to register in Animal Husbandry 35.

Courses for Graduates

103. Personnel Relationships in Teaching, Research, and Extension Work.—Organization and administration of research; objects, methods, and the sources of error in experimental work. Open to graduate students in all departments of the College of Agriculture. Once a week; second semester. *One-half unit.* (Not given in 1939-1940.)

112. Research.—One to three times a week; both semesters. *One-half to two units.* May be taken on Saturday mornings by special arrangement. Investigations along the following lines:
   (a) Economic Factors in Meat Production.—Professors Rusk, Carroll.
   (b) Systems of Livestock Farming.—Professor Case.
   (c) Animal Pathology.—Professor Graham.
   (d) Animal Nutrition.—Professor Mitchell, Associate Professor Hamilton.
   (e) Animal Genetics.—Professor Roberts.
   (f) Poultry Husbandry.—Professor Card.

117. Animal Genetics.—Two to three times a week; both semesters. *One unit.* Professor Roberts.

118. Animal Nutrition Seminar.—A review of current literature in animal nutrition. Two hours a week; both semesters. *One-half unit.* Professor Mitchell.

119. Laboratory Methods in Animal Nutrition.—Two to five times a week; both semesters. *One-half to one unit.* Associate Professor Hamilton.

120. Laboratory Methods in the Diagnosis of Animal Diseases.—Two to five times a week; both semesters. *One-half to one unit.* Professor Graham.

121. Laboratory Methods in Animal Genetics.—Two to five times a week; both semesters. *One-half to one unit.* Professor Roberts.

131. Advanced Course in Animal Nutrition.—Three times a week; second semester. *One unit.* Professor Mitchell.

Courses for Graduates and Advanced Undergraduates

7. Principles of Animal Nutrition.—Five times a week; first semester. Associate Professor Hamilton.

22. Advanced Stock Judging.—Five times a week; first semester. Members of the department.

24. Meat Judging and Special Problems.—Two to five times a week; first semester. Professor Bull.

25. Beef Production.—Three times a week; first semester. Professor Snapp.

26. Pork Production.—Three times a week; first semester. Professor Carroll.
27. Sheep Husbandry.—Three times a week; second semester. Professor Kammlade.
28. History of Breeds of Livestock.—Three times a week; second semester. Professor Edmonds and other members of the department.
33. Horse Production.—Three times a week; second semester. Professor Edmonds, Assistant Professor Crawford.
35. Animal Hygiene, Sanitation, Contagious Diseases of Farm Animals.—Twice a week; second semester. Professor Graham, Dr. Boley.
39. Poultry Breeding and Improvement.—Three times a week; first semester. Professor Card.
40. Economics of Poultry Production.—Three times a week; second semester. Professor Card.
41. Animal Genetics.—Three times a week; second semester. Professor Roberts.
43. Animal Nutrition.—Three times a week; second semester. Open to students whose major is not animal nutrition. Associate Professor Hamilton.

ARCHITECTURE AND ARCHITECTURAL ENGINEERING

The prerequisite for graduate work in architecture is the equivalent of the undergraduate courses required at the University of Illinois for the bachelor's degree in the branches of the subjects in which registration is desired.

Courses for Graduates

101. Architectural Construction.—Theory and design. Twice a week; both semesters. *One-half to two units.* Professor Palmer.
103. Architectural Construction.—Special problems. Twice a week; both semesters. *One-half to two units.* Professor Morgan.
104. Architectural Design.—Advanced course. Twice a week; both semesters. *One to three units.* Professor Deam.
105. Architectural Practice.—Research in special topics. Once a week; both semesters. *One-fourth to one-half unit.* Professor Provine.
106. Architectural History.—Special research. Twice a week; both semesters. *One-half to two units.* Professor Newcomb.

Courses for Graduates and Advanced Undergraduates

15. History of Architecture.—Medieval architecture. Twice a week; first semester. Professor Van Derpool.
16. History of Architecture.—Continuation of 15. Twice a week; second semester. Professor Van Derpool.
17. History of Architecture.—Renaissance. Twice a week; first semester. Professor Van Derpool.
18. History of Architecture.—Modern architecture. Twice a week; second semester. Associate Professor O'Donnell.
35-36. Architectural Design (Intermediate).—Four times a week; both semesters. Assistant Professors Scheick, Love.
37-38. Architectural Design (Advanced).—Six times a week; both semesters. Professor Deam, Mr. Keith.
47. Steel Construction.—Lectures and laboratory. Five times a week; first semester. Professor Morgan.
48. Steel Construction.—Continuation of 47. Five times a week; second semester. Professor Morgan.

57. Reinforced Concrete.—Theory. Three times a week; first semester. Professor Palmer.
58. Reinforced Concrete.—Design. Continuation of 57. Three times a week; second semester. Professor Morgan.
68. Specifications.—Three times a week; both semesters. Professor Provine.
83. Office Practice.—Twice a week; first semester. Professor Provine.

ASTRONOMY

The prerequisites for graduate study in astronomy are mathematics through calculus, a year's course in descriptive astronomy, and a course in college physics.

Courses for Graduates

101. Seminar.—Three times a week; both semesters. *One unit.* Professor Baker.
103. Celestial Mechanics.—Three times a week; both semesters. ***One unit.*** Professor Baker.

Courses for Graduates and Advanced Undergraduates

7. Celestial Mechanics.—Three times a week; second semester. (Not given in 1939-1940.) Professor Baker.
14. Observational Astronomy.—Three times a week; first semester. (Not given in 1939-1940.) Professor Baker.
15. Geodetic Astronomy.—Three times a week; first semester. Professor Baker.

BACTERIOLOGY

Students electing bacteriology as a major study must have had at least 10 semester hours of bacteriology and 15 semester hours of some other physical or biological science. Before receiving a degree a student must have had work equivalent to courses 20, 8, 26, 103, and 107; candidates for the doctor's degree will be held responsible for a general knowledge of the subject as applied to plant pathology, dairy husbandry (dairy bacteriology), and soil biology. Courses in these subjects are listed under their respective departments and will be counted, after conference with adviser, toward the requirements for the doctor's degree.

In addition to the usual examinations in courses, each candidate for the master's degree will be required to pass a general written examination toward the close of the second semester of residence.

Candidates for the doctor's degree with a major study in another field than bacteriology, who elect a first or second minor in bacteriology, must offer a minimum of three units for the first minor and two and one-half units for the second minor selected from the courses offered in this department, or, for satisfactory reasons, certain courses in the departments mentioned above. These courses must include course 103 and one advanced laboratory course in the department of bacteriology.

Note: The attention of students is also called to the following courses offered in other departments. Certain of them must be elected for advanced degrees after conference with adviser. Agronomy 11, 30, and 31; Animal Husbandry 35, 112, and 120; Botany 45, 79, 72, 117, 41, and 170; Dairy Hus-

bandry 10, 106, 112, and 113; Horticulture 51 and 135; Zoology 18, 31, 118, 131, 128, and 121; Chemistry 50a, 86a, and 29b.

Courses for Graduates

103. Physiology of Bacteria.—Twice a week; first semester. *One unit.* Professor Tanner.

107. Research.—For those students who are taking a major in bacteriology either for the doctor's degree or master's degree. Both semesters. *One-half to four units.* Professor Tanner, Assistant Professor Wallace.

118a-118b. Current Literature.—Required of all graduate students whose major is bacteriology. Once a week; both semesters. *One-fourth unit.* Professor Tanner.

Courses for Graduates and Advanced Undergraduates

8. Food and Applied Bacteriology.—Microbiology of foods; food preservation; food-borne infections and intoxications. Five times a week; second semester. Professor Tanner, Assistant Professor Clark.

10. Epidemiology.—Twice a week; second semester. Assistant Professor Wallace.

20. General Bacteriology.—For seniors and graduate students. Five times a week; both semesters. Assistant Professor Wallace, Dr. Edwards.

26. Pathogenic Bacteriology.—Five times a week; first semester. Assistant Professor Wallace.

BOTANY

Candidates for advanced degrees in botany must offer for admission at least 20 hours in botany inclusive of courses 2 or 12 and 3, or 15 hours in botany and 5 hours in a related subject acceptable to the department. Graduate students who elect botany for minor credit must offer 15 hours in botany, or 10 hours in botany and 5 hours in a related subject acceptable to the department.

The department wishes to call the attention of graduate students to courses in agronomy and soils, bacteriology, chemistry, entomology, geography, geology, horticulture, mathematics, physics, physiology, and zoology which are available to advanced students and offer a broad foundation for the different phases of botanical work. The practical work in plant sciences in the College of Agriculture and the Experiment Station offers unusual facilities to the graduate student. Joint majors may be arranged in botany and agronomy.

Courses for Graduates

110. Botanical Discussions.—Required of all graduate students and of members of the instructional staff. Once a week; both semesters. No credit.

112. Discussions in Plant Morphology.—Once a week; both semesters. *One-fourth unit.* Professor Buchholz.

113. Discussions in Plant Physiology.—Once a week; both semesters. *One-fourth unit.* Assistant Professors Fuller, Wynd.

117. Discussions in Plant Pathology and Mycology.—Once a week; both semesters. *One-fourth unit.* Professor Stevens.

118. Discussions in Plant Ecology.—Once a week; both semesters. *One-fourth unit.* Professor Vestal.

133. Advanced Physiology of Growth, Response, and Reproduction.—Once a week; second semester. *One-half unit.* (Not given in 1939-1940.) Assistant Professor Fuller.

134. Chemistry of Plant Products.—Lectures, supervised reading, and reports.

Once or twice a week; first semester. *One-half unit.* (Given in alternate years; not given in 1939-1940.) Assistant Professor WYND.

135. RESEARCH TECHNIQUES IN CHEMICAL PLANT PHYSIOLOGY.—One to three times a week; both semesters. *One-half to one and one-half units.* Assistant Professor WYND.

172. EPIDEMIOLOGY OF PLANT DISEASES.—Once a week; first semester. *One-half unit.* Professor STEVENS.

Research Courses

120. PLANT MORPHOLOGY.—Once or twice a week; both semesters. *One-half to two units.* (Botany 112 to be taken concurrently.) Professor BUCHHOLZ.

130. PLANT PHYSIOLOGY.—Once or twice a week; both semesters. *One-half to two units.* (Botany 113 to be taken concurrently.) Assistant Professors FULLER, WYND.

170. PLANT PATHOLOGY OR MYCOLOGY.—Once or twice a week; both semesters. *One-half to two units.* (Botany 117 to be taken concurrently.) Professor STEVENS.

180. PLANT ECOLOGY OR GEOGRAPHY.—Once or twice a week; both semesters. *One-half to two units.* (Botany 118 to be taken concurrently.) Professor VESTAL.

Courses for Graduates and Advanced Undergraduates

20. CYTOLOGY.—Once or twice a week; second semester. (Given in 1939-1940 and in alternate years.) Professor BUCHHOLZ.

33. PLANT PHYSIOLOGY.—Growth, and the effect of environment on growth. Once or twice a week; first semester. (Not given in 1939-1940.) Assistant Professor FULLER.

34. PLANT PHYSIOLOGY.—Metabolic transformations. Once or twice a week; second semester. Assistant Professor WYND.

40. HISTOLOGICAL TECHNIC.—A survey of the various technics used in the preparation of plant tissues for microscopical examination. Once a week; second semester. Dr. TIPPO.

41. ALGAE AND BRYOPHYTES.—Morphology and classification. Once or twice a week; second semester. Dr. HAGUE.

43. PTERIDOPHYTES.—Comparative morphology. Once or twice a week; first semester. (Given in alternate years; not given in 1939-1940.) Professor BUCHHOLZ.

44. SPERMATOPHYTES.—Comparative morphology. Once or twice a week; second semester. (Given in alternate years; not given in 1939-1940.) Professor BUCHHOLZ.

45. PLANT ANATOMY.—The study of the internal structure of vascular plants with special emphasis on function and evolutionary history. Once a week; first semester. Dr. TIPPO.

46. HEREDITY AND EVOLUTION.—The cell in inheritance, environment, adaptation, and evolution. Once or twice a week; first semester. (Given in 1939-1940 and in alternate years.) Professor BUCHHOLZ.

55. PLANT GEOGRAPHY OF NORTH AMERICA.—Regional divisions; climate, soil, topography, vegetation, vegetational history. Once or twice a week; first semester. (Given in 1939-1940 and in alternate years.) Professor VESTAL.

56. PLANT GEOGRAPHY.—Plants and vegetation of continents other than North America; geographic relations of floras. Once or twice a week; first semester. (Given in alternate years; not given in 1939-1940.) Professor VESTAL.

60. ADVANCED SYSTEMATIC BOTANY.—Phylogenetic study of flowering plants. Relationship of the principal orders and families, rules of taxonomy and the identification of species. Once or twice a week; first semester. (Given in alternate years; not given in 1939-1940.) Assistant Professor FULLER.

72. Mycology.—Structure, classification, and identification of fungi, including those of economic importance. Once or twice a week; second semester. Professor Stevens.

79. Research Methods in Plant Pathology.—Once or twice a week; first semester. Professor Stevens.

80. Ecology: Plant Environments.—Analysis of complexes of factors; correlations with plants and with vegetation. Once or twice a week; second semester. (Given in 1939-1940 and in alternate years.) Professor Vestal.

81. Plant Ecology.—Principles of ecology as exemplified by vegetation and environments of Illinois. Field study on four or five Saturdays. Once or twice a week; first semester. Professor Vestal.

88. Ecology: Plant Communities.—Characteristics, composition, and classes of vegetation-units. Once or twice a week; second semester. (Given in alternate years; not given in 1939-1940.) Professor Vestal.

BUSINESS ADMINISTRATION

The degree Master of Business Administration is granted to those who complete satisfactorily a course of study which is substantially a fifth year of work in departments of the College of Commerce and Business Administration. The work of such fifth year is supervised by a committee representing the courses in economics, accountancy, and business organization and operation. The degree may be conferred on candidates who have completed satisfactorily the required amount of seminar work and study, and passed a comprehensive examination in the various aspects of business administration—production, personnel, administration, control (accounting and statistics), finance, market distribution, and social responsibility.

For the present, at least, all students in this course must register for full-time graduate study, four units a semester, beginning the first semester and continuing through the second semester.

The requirements for registration in the course leading to the degree are: (1) a bachelor's degree from a recognized college of commerce, school of business, or the equivalent, and (2) a scholastic average in academic subjects substantially above the minimum requirements for that bachelor's degree.

Courses for Graduates

100. Seminar.—Four times a week; both semesters. *Four units.* Professors Littleton, Dillavou, and other members of the staffs of the departments in the College of Commerce and Business Administration.

BUSINESS ORGANIZATION AND OPERATION
(Including Accountancy and Business Law)

ACCOUNTANCY

Accountancy may be taken as a major for the degree of Master of Science or Doctor of Philosophy. A student registering in accountancy as a major must have the equivalent of 20 semester hours in accountancy and also at least one course each in principles of economics and finance. One desiring to pursue accountancy as a minor must present similar courses, with 15 instead of 20 credit hours in accountancy as a minimum. Accountancy 4a is a prerequisite for 106; 3b for 110; 13 for 113; and 20 for 120.

Courses for Graduates

101. Concepts and Principles.—Twice a week; second semester. *One unit.* Professor Littleton.

103. Income Determination.—Twice a week; first semester. *One unit.* Professor Littleton.

104. Accounting Systems.—Twice a week; both semesters. *One unit.* Professor Scovill.

106. Cost Accounting.—Twice a week; second semester. *One unit.* Professor Schlatter.

107. Surplus and Dividends.—Twice a week; first semester. *One unit.* Professor Littleton.

109. Accounting History.—Twice a week; second semester. *One unit.* Professor Littleton.

113. Governmental Accounting.—Twice a week; either semester. *One unit.* Professor Morey.

120. Income Tax Development.—Twice a week; first semester. *One unit.* Professor Filbey.

129. Thesis.—Once a week; both semesters. *One unit.* Professor Littleton and members of the staff.

Courses for Graduates and Advanced Undergraduates

3a. Advanced Accounting.—Three times a week; either semester. Associate Professor Theiss, Assistant Professor Newcomer.

3b. Auditing.—Three times a week; either semester. Professor Filbey, Associate Professor Theiss.

4a. Cost Accounting.—Twice a week; either semester. Professor Schlatter.

4b. Accounting Systems.—Twice a week; either semester. Associate Professor Baily.

5a–5b. C.P.A. Problems.—Three times a week; both semesters. Professor Scovill.

13. Governmental Accounting.—Twice a week; either semester. Professor Morey, Assistant Professor Hackett.

20. Income Tax Procedure.—Twice a week; either semester. Professor Filbey.

30. Budgets and Accounting Control.—Three times a week; either semester. Associate Professor Theiss.

BUSINESS ORGANIZATION AND OPERATION

Work may be done in the field of business organization and operation for a major or a minor for the M.S. degree, and for a minor for the doctorate. To do major work in this field, a student must have completed at least 20 semester hours of work in marketing, management, business administration, economics, business law, or accountancy. To do minor work in this field, a student must have had at least 12 semester hours of work in the subjects named above for a major. To do work either in marketing or management, the student must have completed a course in the fundamentals of the subject.

Courses for Graduates

102. Marketing Research and Policies.—Twice a week; both semesters. *One unit.* (Not given in 1939-1940.) Professor Converse.

104. Scientific Management.—A study of modern management methods and procedures, particularly as they apply to industrial enterprises. Twice a week; both semesters. *One unit.* Professor Anderson.

107. Sales Campaigns.—Twice a week; both semesters. *One unit.* Professor Russell.

126. Analysis of Consumer Markets.—Once a week; first semester. *One unit.* Professor Converse.

127. Prices and Price Policies.—Once a week; second semester. *One unit.* (Not given in 1939-1940.)

129. Seminar.—Time to be arranged; both semesters. *One unit.* Professor Russell and others.

Courses for Graduates and Advanced Undergraduates

3. Retail and Chain Store Organization and Operation.—Three times a week; either semester. Mr. Mitchell.

4. Management in Manufacturing.—Three times a week; both semesters. Professor Anderson.

7. Salesmanship.—Twice a week; either semester. Assistant Professor Beach.

8. Advertising.—Three times a week; either semester. Professor Russell.

9. Trade Associations and Commercial Organizations.—Twice a week; second semester. (Not given in 1939-1940.)

14. The Technique of Executive Control.—Three times a week; both semesters. Professor Anderson.

17. Problems in Sales Administration.—Twice a week; either semester. Assistant Professor Beach.

18. Advertising Campaigns.—Three times a week; second semester. Professor Russell.

20. Credits and Collections.—Three times a week; either semester. Assistant Professor Huegy.

22. Marketing Research and Policies.—Twice a week; first semester. Professor Converse.

25. History of Marketing in the United States.—Three times a week; first semester. Dr. Jones.

32. Contemporary Problems in Marketing Management.—Three times a week; second semester. Professor Russell.

BUSINESS LAW

Course for Graduates and Advanced Undergraduates

10. Law of Security Relations and Banking.—Three times a week; either semester. Professor Dillavou.

CERAMIC ENGINEERING

This department offers graduate work leading to the degrees of Master of Science in Ceramics, Master of Science in Ceramic Engineering, Doctor of Philosophy in Chemistry (Ceramic Chemistry), and Doctor of Philosophy in Engineering.

The prerequisite for a major in graduate work in ceramics or ceramic engineering is proficiency in the undergraduate courses required for the degree of Bachelor of Science in the branch of the subject in which registration is desired, or substantial equivalents.

Candidates for the degree of Doctor of Philosophy in Chemistry (Ceramic Chemistry) must have had the equivalent of at least 25 semester hours of satisfactory courses in general, analytical, physical, and organic chemistry; also calculus, one year of college physics, one semester of optical mineralogy, and at least 18 semester hours or their equivalent in acceptable ceramic courses.

Courses for Graduates

101. Chemistry of the Compounds of Silicon.—Twice a week; both semesters. *One unit.* Professor Parmelee.

102. General Technology of the Silicate Industries.—Twice a week; both semesters. *One to two units.*
   (a) Ceramic Materials and Processes.—Professor Parmelee.
   (b) Drying and Firing Processes.—Professor Hursh.
   (c) Enamels and Equilibrium Studies.—Professor Andrews.
   (d) Refractories.—Professor Andrews.

103. Chemistry of Silicates.—Laboratory to supplement Ceramic Engineering 101, which must precede or accompany it. Both semesters. *One to two units.* Professor Parmelee.

104. Technology of Glass.—Twice a week; second semester. *One to two units.* Professor Parmelee.

105. Methods of Ceramic Research.—Twice a week; second semester. *One unit.* Professor Parmelee.

106. Research.—Both semesters. Professors Parmelee, Hursh, Andrews.

Courses for Graduates and Advanced Undergraduates

5. Ceramic Bodies.—Five times a week; first semester. Professor Parmelee.

7. Structural Clay Products.—Three times a week; first semester. Professor Andrews.

8. Glass Technology.—Twice a week; second semester. Professor Parmelee.

10. Cements.—Twice a week; second semester. Professor Andrews.

11. Drying Clay Products.—Three times a week; second semester. Professor Hursh.

14. Glasses and Glazes.—Three times a week; second semester. Professor Parmelee.

16. Enamels.—Three times a week; second semester. Professor Andrews.

17. Enamels.—Three times a week; first semester. Professor Andrews.

18. Ceramic Microscopy.—Three times a week; both semesters. Mr. Pask.

20. Refractory Materials.—Twice a week; second semester. Professor Andrews.

22. Kilns and the Burning of Clay Products.—Three times a week; first semester. Professor Hursh.

23. Dryer and Kiln Design.—Twice a week; first semester. Professor Hursh.

24. Ceramic Engineering Design.—Three times a week; second semester. Professor Hursh.

28. Pyrochemical Problems.—Twice a week; second semester. Professor Andrews.

CHEMISTRY
(Including Chemical Engineering)

Students who intend to take graduate work in chemistry or chemical engineering should include in their undergraduate preparation at least the equivalent of one full year of physics, one year of French, one year of German, and mathematics through differential and integral calculus. Any student without the necessary physics or mathematics may enter the Graduate School but will be required to spend part of his time in residence on the above-mentioned subjects.

Without two semesters of college work in one language (German preferred) the student will not be allowed to enter.

Due to limited space in the chemistry and chemical engineering laboratories at the University of Illinois, it is recommended that each new student notify the Head of the Department of Chemistry at the time of his request for admission to the Graduate School. He should state the degree for which he wishes to study and the *field of specialization.* Neglect to do this may result in a delay before an individual will be accepted for research, or may make it impossible for a student to continue work for the doctor's degree. See regulation under Chemistry 190a-190b, Research.

Graduate students whose major subject is in some department other than chemistry, before taking graduate work for credit in this department, must have had the equivalent of 15 semester hours in chemistry, and the ground covered should include satisfactory work in general chemistry and in qualitative and quantitative analysis and elementary organic chemistry. Such students are advised to make selections from the following courses: Chemistry 40, 41, 42, 43, 27, 36 and 37, 50, 63b, 67b, 15b, 16b, and 29b. Courses of a more special nature will not as a rule be accepted for graduate work unless preceded by one of the courses above. Graduate students who are candidates for an advanced degree in chemistry must have had the equivalent of 25 semester hours in chemistry properly distributed.

Graduate students whose major subject is in some department other than chemistry and who intend to take a first minor in chemistry or any branch of chemistry toward the Ph.D. degree must include among the courses taken Chemistry 40 and 41, or must have had the equivalent.

Graduate students who are candidates for the A.M. or M.S. degree in chemistry must include among the courses taken Chemistry 40 and 41, or must have had the equivalent. Graduate students who are candidates for the Ph.D. degree in any branch of chemistry must include among their courses Chemistry 40, 41, 42, and 43, or must have had the equivalent. Graduate students who are candidates for the Ph.D. degree in chemical engineering should substitute Chemistry 44a for Chemistry 43 in the above sequence.

Courses for Graduates

Inorganic Chemistry

101a–101b. Inorganic Chemistry.—The less familiar elements and their relationship in the periodic system. Lectures; recitations. Twice a week; both semesters. *One-half unit.* Professor Hopkins.

102a–102b. Inorganic Chemistry.—(Laboratory.) Inorganic preparations and qualitative analysis of the less familiar elements. To accompany or follow Chemistry 101a–101b. One to three times a week; both semesters. *One-fourth to three-fourths unit.* Professor Hopkins.

105a-105b. Inorganic Chemistry.—(Seminar.) Current literature. (Required of all students whose major is inorganic chemistry.) Once a week; both semesters. *One-fourth unit.* Professor Hopkins.

106a. Inorganic Chemistry.—Special topic: Reactions in solids. Twice a week; first semester. *Three-fourths unit.* Dr. Reed.

106b. Inorganic Chemistry.—Special topic: Chemistry of inorganic pigments. Twice a week; second semester. *Three-fourths unit.* Dr. Nicholson.

115a. Inorganic Chemistry.—The periodic relationship of the commercially important elements, their applications and compounds. Lectures, reports, recitations. *(Note:* Students who have received credit in Chemistry 15a or 15b are not allowed to take Chemistry 115a for credit.) Three times a week; first semester. *Three-fourths unit.* Associate Professor Copley.

116a. Synthetic Inorganic Chemistry.—(Laboratory). Advanced inorganic preparations. One to three times a week; first semester. *One-fourth to three-fourths unit.* Associate Professor Copley.

Analytical Chemistry

121b. Qualitative Microanalysis.—Conferences and laboratory. Three times a week; second semester. *Three-fourths unit.* Associate Professor Reedy.

123a. Qualitative Analysis.—The principles and methods of analytical chemistry; theory of solutions. Lectures. Twice a week; first semester. *One-half unit.* Associate Professor Reedy.

124b. Quantitative Analysis.—A modern survey of advanced principles, calculations, experimental methods and applications. Lectures. Twice a week; second semester. *One-half unit.* Professor Smith.

124d. Quantitative Analysis.—Laboratory, optional, to accompany Chemistry 124b. Twice a week; second semester. *One-half unit.* Professor Smith.

125a-125b. Analytical Chemistry.—(Seminar.) Special topics in analytical chemistry. (Required of all students taking a major or minor in analytical chemistry.) One to three times a week; both semesters. *One-fourth to one unit.* Professor Clark.

126a. Quantitative Instrumental and Chemical Methods of Analysis in Chemical Research.—(Spectroscopy, refractometry, spectrophotometry, colorimetry, microscopy, etc.) Lectures; laboratory. Three times a week; first semester. *Three-fourths unit.* Associate Professor Englis.

127a–127b. Applied X-rays.—Lectures. Twice a week; both semesters. *One-half unit.* Professor Clark.

127c–127d. Applied X-rays.—Laboratory, optional, to accompany Chemistry 127a–127b. Twice a week; both semesters. *One-half unit.* Professor Clark.

Organic Chemistry

130a. Organic Chemistry.—Survey of organic chemistry designed for first-year graduate students. Three times a week; first semester. *One unit.* Professor Fuson.

132b. Organic Chemistry.—Advanced survey of organic chemistry (to follow Chemistry 130a). Three times a week; second semester. *One unit.* Professor Shriner.

133a. Organic Chemistry.—Optical isomerism, cis-trans isomerism, tautomerism, chemistry of the carbohydrates, etc. Twice a week; first semester. *Three-fourths unit.* Professor Adams.

134. Organic Chemistry.—(Laboratory.) Advanced organic synthesis. Two to four times a week; both semesters. *One-half to one unit.* Professors Fuson, Shriner.

135a–135b. Organic Chemistry.—(Seminar.) Current literature. Once a week; both semesters. *One-fourth unit.* Professor Adams.

136b. Organic Chemistry.—Lectures and laboratory work on newer methods in organic laboratory procedure. Twice a week; second semester. *Three-fourths unit.* Professor Shriner.

Physical Chemistry

144a-144b. Physical Chemistry.—Kinetic theory, statistical mechanics, molecular dynamics. Lectures. Twice a week; both semesters. *Three-fourths unit.* Dr. Wall.

145a–145b. Physical Chemistry.—(Seminar.) Recent development in physical chemistry. Twice a week; both semesters. *Three-fourths unit.* Professor Rodebush and staff.

Biochemistry

150b. Biochemistry.—Chemistry of intermediary metabolism. Lectures; readings. Twice a week; second semester. *Three-fourths unit.* Professor Rose.

152a-152b. Biochemistry.—Difficult biochemical preparations; chiefly laboratory. One to five times a week; both semesters. *One-half to one unit.* Professor Rose.

155a-155b. Biochemistry.—(Seminar.) Current literature. (Required of all graduate students whose major is biochemistry.) Twice a week; both semesters. *Three-fourths unit.* Professor Rose.

Chemical Engineering

160a. Flow of Fluids.—(Especially for first-year graduate students.) Lectures. Twice a week; first semester. *One-half unit.* Professor Keyes.

161a. Heat Transmission.—(Especially for first-year graduate students.) Lectures. Twice a week; first semester. *One-half unit.* Assistant Professor Comings.

163a. Evaporation, Drying, Humidification, and Dehumidification.—Lectures. Twice a week; first semester. *One-half unit.* Professor Johnstone.

165a-165b. Chemical Engineering.—(Seminar.) (Required of all graduate students whose major is chemical engineering.) Once a week; both semesters. *One-fourth unit.* Professor Keyes and staff.

167b. Distillation.—Lectures. Twice a week; second semester. *One-half unit.* Professor Keyes.

168b. Economic Balance and Plant Design.—Lectures. Twice a week; second semester. *One-half unit.* Professor Johnstone.

Water Chemistry

185a-185b. Chemistry of Water Treatment.—(Seminar.) Special problems and new developments in sanitary chemistry. Once a week; both semesters. *One-fourth to one and one-fourth units.* Professor Buswell.

Miscellaneous

190a-190b. Research.—Candidates for the master's degree who elect to do research are required to present a thesis. A thesis is always required of students taking the degree of Doctor of Philosophy. Work may be taken in the following fields subject to the approval of one of the qualified staff members. Not all candidates for thesis work will necessarily be accepted. Both semesters. Any students whose major is in departments other than chemistry must receive permission from the Head of the Department of Chemistry to register in this course.

Physical and Electrochemistry.—Professors Rodebush, Phipps, Associate Professor Copley.

Inorganic Chemistry.—Professor Hopkins, Associate Professors Reedy, Audrieth, Bailar, Copley, Dr. Reed, Dr. Nicholson.

Analytical Chemistry.—Professors Clark, Smith, Associate Professors Reedy, Englis.

Applied X-rays.—Professor Clark.

Food Chemistry.—Associate Professor Englis.

Phytochemistry.—Associate Professor Englis.

Organic Chemistry.—Professors Adams, Marvel, Fuson, Shriner, Dr. Price.

Colloid Chemistry; Water Chemistry; Zymochemistry.—Professor Buswell.

Biochemistry.—Professor Rose, Assistant Professor Carter.

Chemical Engineering.—Professors Keyes, Johnstone, Associate Professor Swann.

Ceramic Chemistry.—Professor Parmelee.

Non-aqueous Solvents.—Assistant Professor Audrieth.

192a. Chemical Literature and Reference Work.—Once a week; first semester. *One-fourth unit.* Assistant Professor Bartow.

Courses for Graduates and Advanced Undergraduates

Analytical Chemistry

25a. Survey of Analytical Chemistry.—An intensive review of the fundamental principles and procedures of qualitative and quantitative analysis. Three times a week; first semester. Associate Professor Reedy.

27. Special Methods and Instruments in Quantitative Analysis.—Three times a week; both semesters. Professor Smith.

29b. Food Analysis.—Quantitative organic analysis of food products; alcohols, carbohydrates, fats and oils, cereals, nitrogenous bodies, preservatives, and colors. Six times a week; second semester. Associate Professor Englis.

Organic Chemistry

36. Organic Chemistry.—(Second course.) Lectures and recitations. Three times a week; both semesters. Professor Marvel.

37. Organic Chemistry.—(Laboratory.) Organic synthesis. To accompany Chemistry 36. Twice a week; both semesters. Professor Fuson.

38. Systematic Identification of Organic Compounds.—Identification of pure organic compounds and mixtures. Twice a week; both semesters. Professors Shriner, Fuson.

Physical Chemistry

40. Elementary Physical Chemistry.—Three times a week; both semesters. Professors Rodebush, Phipps.

41. Elementary Physical Chemistry.—(Laboratory.) To accompany Chemistry 40. Once a week; both semesters. Professors Rodebush, Phipps, and assistants.

42b. Elementary Physical Chemistry.—Three times a week; second semester. Professor Phipps.

43b. Elementary Physical Chemistry.—(Laboratory.) Once a week; second semester. Professor Phipps and assistants.

44a. Advanced Physical Chemistry.—Thermodynamics and free energy calculations. Twice a week; first semester. Professors Rodebush, Phipps.

46b. Advanced Physical Chemistry.—Atomic structure and valence. Twice a week; second semester. Professor Rodebush.

49b. Chemistry of Colloids.—Lectures and demonstrations. Preparation and properties of colloids. Special apparatus and technique employed in colloid chemistry. Three times a week; second semester. Professor Buswell, Dr. Gore.

Biochemistry

50. Biochemistry.—Proteins, fats, and carbohydrates; tissues, digestion, intestinal putrefaction, and feces; quantitative analysis of gastric contents, blood, and urine. Lectures; laboratory. Five times a week; both semesters. Professor Rose, Assistant Professor Carter, Dr. Vestling, and assistants.

51b. Problems of Metabolism.—Micro-methods of blood and urine analysis, and their application. Lectures; laboratory. Three times a week; second semester. Assistant Professor Carter, and assistants.

52b. Biochemistry of Vitamins and Hormones.—Lectures; readings. Twice a week; second semester. Assistant Professor Carter.

Chemical Engineering

60a. Chemical Engineering Unit Processes.—Heat and material balances and design problems. Lectures. Three times a week; first semester. Assistant Professor Deem.

61a–61b. Principles of Chemical Engineering.—Basic principles underlying the design and operation of the chemical engineering unit operations. Lectures. Three times a week; both semesters. Assistant Professor Comings.

62a. Principles of Research and Development.—The fundamental methods used in research and development in chemical industry. Twice a week; first semester. Professor Keyes.

63b. Introduction to Chemical Engineering.—Three times a week; second semester. Assistant Professor Deem.

64b. High Pressure Reactions.—Twice a week; second semester. Assistant Professor Comings.

65b. Chemical Engineering Calculations.—Three times a week; second semester. Professor Johnstone.

67b. Chemical Technology.—Modern industrial chemical processes. Three times a week; second semester. Assistant Professor Deem.

68a–68b. Unit Operations.—Laboratory. (To accompany Chemistry 61a and 61b.) Once a week; both semesters. Professor Johnstone, Assistant Professors Comings, Deem.

69a–69b. Chemical Engineering Projects.—Laboratory. Development of an individual project. Once a week; both semesters. Professor Johnstone, Assistant Professors Comings, Deem.

70b. Economics of Chemical Engineering.—Lectures. Twice a week; second semester. Professor Keyes.

71a. Applied Electrochemistry.—Twice a week; first semester. Associate Professor Swann.

72a. Power Plant and Boiler Water Problems.—Twice a week; first semester. Associate Professor Straub.

Water Chemistry

86a. Chemistry of Water Treatment.—Lectures, demonstrations, field trips. Methods for determining water quality. Special water requirements of industries. Chemistry of water conditioning for municipal and industrial use. By-product recovery from industrial and other wastes. Three times a week; first semester. Professor Buswell.

Miscellaneous

95a. History of Science with Particular Reference to Chemistry.—Lectures; reading. Twice a week; first semester. Assistant Professor Bartow.

CIVIL ENGINEERING

The prerequisite for graduate work in civil engineering is the equivalent of the undergraduate course required for the degree of Bachelor of Science in civil engineering in the branches of the subject in which registration is desired.

Courses for Graduates

101. Water Supply.—Design, pumping machinery, administration, operation. Twice a week; first semester. *One unit.* Professor Babbitt.

102. Sewerage.—Sewer design, construction, maintenance, operation, and financing. Twice a week; second semester. *One unit.* Professor Babbitt.

103. Highway Engineering.—A detailed examination of all paving materials and methods of construction; experimental pavements; road improvements; soil stabilization; machinery for highway construction; city, state, and regional planning; airports; and future planning. Twice a week; first semester. *One unit.* Professor Crandell.

104. Municipal Engineering.—City finances and budgets, the work of the city manager and city engineer, zoning, play grounds and parks, street cleaning; smoke prevention, and fire prevention. Twice a week; second semester. *One unit.* Professor Crandell.

105. Reinforced Concrete Design.—Theories of action of beams, slabs and columns of reinforced concrete. Codes and specifications and their influence on design. Effect of continuity. Twice a week; first semester. *One unit.* Professor Shedd.

106. Structural Theory and Design.—General theory of continuity. Moment distribution. The column analogy. Rigid frame bridges and buildings. Fixed and continuous arches. Classification of structures from viewpoint of design. Twice a week; first semester. *One or two units.* Professor Shedd.

107. Steel Design.—Design of steel members. Codes and specifications for buildings. Riveted and welded connections. Evolution of bridge specifications. Loads and working stresses. Economic proportions. Twice a week; second semester. *One unit.* Professor Shedd.

108. Structural Theory and Design.—Statically indeterminate trusses. Continuous trusses. Steel arches. Secondary stresses. Suspension bridges. Long span roofs. Skeleton steel buildings. Twice a week; second semester. *One or two units.* Professor Shedd.

109. Public Health Engineering.—Design of water purification works and principles of sanitation. Twice a week; first semester. *One unit.* Professor Babbitt.

110. Sewage Disposal, Wastes Disposal, and General Sanitation.—Principles and design of sewage treatment and waste disposal works. Twice a week; second semester. *One unit.* Professor Babbitt.

112. Masonry Construction.—Design and construction of dams, earth embankments; retaining walls, abutments and piers, culverts, grain elevators, and bins. Three times a week; first semester. *One unit.* Professor Huntington.

113. Soil Mechanics and Foundations.—Geological considerations; sub-surface exploration; classification, properties, and tests of rock and soil; stress distribution under foundations; consolidation and settlement; percolation and seepage; spread footings; pile foundations; deep foundations; dam foundations. Three times a week; second semester. *One unit.* Professor Huntington, Assistant Professors Bauer, Newmark.

114. Analytical Study of Tests of Structural Steel Members.—Planning tests, limitations of experimental methods, interpretation of results in terms of design practice. Twice a week; second semester. *One unit.* Professor Wilson.

120. Highway Traffic, Transport, and Safety.—The development, distribution, and characteristics of highway traffic. Traffic survey methods and analysis. Traffic laws and regulations. Traffic control methods and devices. Causes and prevention of accidents. Accident reports and analysis. Safety methods, programs, and education. Twice a week; first or second semester. *One unit.* Professor Wiley.

130. Hydrology and Flood Control.—Magnitude and frequency of flood flow of streams, minimum flow of streams and regulation of flow by storage reservoirs, intense rainfall and the development of intensity curves for use in rational run-off formula, unit-graph method of computing flood run-off, flood control and prevention by channel improvements, levees, and reservoirs. Twice a week; first or second semester. *One unit.* Professor Pickels.

131. Water Power.—Preliminary investigations, selection of site, storage requirements, structures, machinery, etc. Twice a week; second semester. *One unit.* (Not given in 1939-1940.) Professor Doland.

140. Special Problems.—Individual investigations and studies of various phases of civil engineering. First or second semester. *One-half to two units.* Members of the department.

198. Thesis.—First or second semester. *One to two and one-half units.* Members of the department.

Courses for Graduates and Advanced Undergraduates

67-68. Statically Indeterminate Structures.—The elastic theory and its applications in statically indeterminate structures. Three times a week; both semesters. Professor Shedd.

Note.—Other advanced undergraduate courses are available, upon the approval of the adviser and the Dean, to meet the needs of individual students.

THE CLASSICS

The Degree of Master of Arts in the Classics.—The major may be either Latin or Greek.

The Degree of Doctor of Philosophy in the Classics.—The degree is given in classical philology. Major work may be taken in either Latin or Greek, but whichever language is taken as a major, the other must be taken as a first minor.

GREEK

Preparation for first-year graduate work in Greek should include at least two years of preparatory Greek, two years of college Greek, and two years of college Latin. A reading knowledge of French and German is important for candidates in this subject. The study of history and philosophy is especially recommended.

Courses for Graduates

104a. Homer.—Lectures and reading the text of the Iliad, with introduction to the Homeric Question primarily from the side of philology and literature. Twice a week; first semester. *One unit.* Professor Oldfather.

104b. Homer.—Lectures and reading; the Homeric Question primarily from the side of archaeology and history. Twice a week; second semester. *One unit.* Professor Mylonas.

110. Bibliography and Criticism.—(Thesis course; the same as Latin 110.) Once a week; both semesters. *One unit.* Professors Oldfather, Canter, Associate Professor Perry.

Courses for Graduates and Advanced Undergraduates

7. Greek Drama: Tragedy and Comedy.—Three times a week; first semester. Professor Oldfather.
8. Greek Oratory and Aristotle.—Three times a week; second semester. Associate Professor Perry.

18a. Greek Archaeology.—Twice a week; first semester. Professor Mylonas.

18b. Greek Archaeology.—Twice a week; second semester. Professor Mylonas.

55. Greek History.—Three times a week; first semester. Professor Oldfather.

LATIN

Preparation for first-year graduate work in Latin should include at least two years of preparatory Latin and four years of college Latin. A reading knowledge of French and German is important. Some acquaintance with Greek is highly desirable, and the study of history and philosophy is especially recommended.

Courses for Graduates

106. Terence.—Twice a week; second semester. *One unit.* Professor Oldfather.

109. Vergil.—Twice a week; first semester. *One unit.* Professor Canter.

110. Bibliography and Criticism.—(Thesis course; the same as Greek 110.) Once a week; both semesters. *One unit.* Professors Oldfather, Canter, Associate Professor Perry.

150. Cicero's Letters.—Twice a week; second semester. *One unit.* Professor Canter.

Courses for Graduates and Advanced Undergraduates

10. Latin Composition.—Twice a week; second semester. Associate Professor Perry.
21. Tacitus (*Annales*) and Juvenal.—Three times a week; first semester. Professor Canter.
22. Martial, Suetonius, and Apuleius.—Three times a week; second semester. Professor Canter.
56. Roman History.—Three times a week; second semester. Professor Oldfather.

DAIRY HUSBANDRY

A graduate student may elect dairy husbandry as his major subject for the degree of Master of Science or Doctor of Philosophy.

For either degree a first minor must be taken outside the department, preferably outside the college. If a second minor is elected it may with proper approval be chosen in the department.

Candidates for advanced degrees in dairy husbandry must have had adequate training in collegiate courses in dairy husbandry. In addition, depending upon his field of specialization, the student should have had courses in the following subjects: chemistry, bacteriology, physics, economics, zoology, genetics, and mathematics.

Courses for Graduates

(Research and courses in assigned problems may be taken on Saturday mornings.)

101. Economic Milk Production.—Twice a week; both semesters. *One-half to two units.* Professor Yapp.

105. Dairy Manufactures.—Both semesters. *One-half to two units.* Professors Ruehe, Tracy, Assistant Professor Tuckey.

106. Dairy Bacteriology.—Research on assigned problems. Both semesters. *One-half to two units.* Professor Prucha.

107. Dairy Chemistry.—Assigned problems. Both semesters. *One-half to two units.* Professor Overman.

108. Physiology of Lactation.—Both semesters. *One-half to two units.* Professor Gaines.

112. Research.—Graduate students writing theses should so indicate in registering in Dairy Husbandry 112. Both semesters. *One to four units.* Special problems along the following lines:
   (a) Dairy Bacteriology.—Professor Prucha.
   (b) Dairy Chemistry.—Professor Overman.
   (c) Dairy Cattle Breeding.—Professor Yapp.
   (d) Dairy Cattle Feeding.—Professor Nevens.
   (e) Milk Production.—Professor Gaines.
   (f) Dairy Manufactures.—Professors Ruehe, Tracy, Assistant Professor Tuckey.

113. Seminar.—Current literature in dairy bacteriology, dairy chemistry and dairy manufactures. Once a week; both semesters. *One-half unit.* Members of the Graduate Staff.

114. Seminar.—Current literature relating to various phases of milk production. Once a week; both semesters. *One-half unit.* Professors Gaines, Yapp, Nevens.

Courses for Graduates and Advanced Undergraduates

5. Composition of Dairy Products.—Three times a week; second semester. Professor Overman.

10. Advanced Dairy Bacteriology.—Three times a week; first semester. Professor Prucha, Assistant Professor Brannon.

17. Advanced Study of Dairy Breeds.—Three times a week; first semester. Professor Yapp.

20. Problems in Dairy Farming.—Three times a week; first semester. Professor Yapp.

21. Systems of Dairy Farming.—Three times a week; second semester. (Not given in 1939-1940.)

25. Advanced Dairy Cattle Feeding.—Twice a week; first semester. Professor Nevens.

30. Advanced Dairy Manufactures.—Three times a week; second semester. Professor Tracy.

31. Advanced Dairy Manufactures.—Three times a week; first semester. Professor Ruehe, Assistant Professor Tuckey.

32. Plant Management.—Three times a week; first semester. Professor Tracy.

ECONOMICS

Students who wish to make economics their major subject for an advanced degree must have had at least 27 hours of undergraduate work in social science, 15 of which must have been in economics; the work in economics must include a course in principles of economics, a course in statistics, and other courses for which the course in principles is a prerequisite. Students in other departments who wish to take a minor in economics must have had at least 12 hours in social science, 8 hours of which must have been in economics, consisting of a course in principles of economics and other courses for which the course in principles is a prerequisite. Students who can not meet these requirements may register for graduate work but, unless specially exempted for reasons satisfactory to the

adviser in charge, must remove any deficiencies during the first year of residence by taking prescribed courses without graduate credit.

A first-year student whose major is economics must take either Economics 101 or 103 throughout the year. If a minor is taken outside the department, two units of work will ordinarily be required. Undergraduate courses that are approved for graduate credit may be taken in lieu of graduate courses but not to exceed a total credit of two units.

A student who aspires to become a candidate for the doctor's degree with a major in economics must pass a preliminary examination in which he will be held responsible for: (1) a detailed knowledge of economic theory and its history; (2) a detailed knowledge of certain special fields of economics (which may include agricultural economics), the number and selection of which is to be determined by the adviser in consultation with the student; and (3) a general acquaintance with the subject matter and bibliography of other branches of economics. If a student offers work in some related field outside the department he will be expected to satisfy the examiners as to his proficiency in that subject.

A student who chooses economics as a minor for the doctor's degree must take at least two units of work in the department.

Courses for Graduates

101. Economic Theory.—Planned primarily for students with a minor in economics. Twice a week; both semesters. *One unit.* Assistant Professor Blodgett.

102. Monetary Theory and History from the Restriction Period to the Present.—Twice a week; both semesters. *One unit.* (Not given in 1939-1940.) Professor Wright.

103. Distribution.—Twice a week; both semesters. *One unit.* Assistant Professor Whittaker.

104a. Theories and Policies of International Trade.—Twice a week; first semester. *One unit.* Professor Litman.

104b. Organization of International Trade.—Twice a week; second semester. *One unit.* Professor Litman.

105. Public Finance.—Twice a week; both semesters. *One unit.* Professor Hunter.

106. International Exchange and the Money Markets.—Twice a week; second semester. *One unit.* (Not given in 1939-1940.)

107. The Corporation in Economic Evolution.—Twice a week; first semester. *One unit.* (Not given in 1939-1940.) Associate Professor Brown.

109. Theory and Practice of Central Banks.—Twice a week; first semester. *One unit.*

110. Corporation Finance.—Twice a week; both semesters. *One unit.* Assistant Professor Green.

112. Labor Problems.—Twice a week; both semesters. *One unit.*

118. Seminar.—Thesis course. (All graduate students writing theses in economics must register in Economics 118; registration for other students is optional.)
(a) Third Year: Seminar.—Professor Litman.
(b) First Year: General Economics.—Associate Professor Brown.

120. History of Economic Thought.—Twice a week; both semesters. *One unit.* Assistant Professor Whittaker.

122. Economic History of the United States.—Twice a week; both semesters. *One unit.* Dean Thompson.

123. Industrial and Financial Organization of Society.—Twice a week; first semester. *One unit.* Professor Lee.

124. International Economics and Finance.—Twice a week; both semesters. *One unit.* (Not given in 1939-1940.)

136. Investments.—Twice a week; both semesters. *One unit.* Associate Professor Brown.

140. Comparative Economic Systems.—Twice a week; second semester. *One unit.* Assistant Professor Blodgett.

144. The Theory and Measurement of Business Cycles.—Twice a week; both semesters. *One unit.* Associate Professor Dickinson.

165. Social Control of Business.—Twice a week; both semesters. *One unit.* Associate Professor Gray.

170. Economic Statistics.—Twice a week; both semesters. *One unit.* Assistant Professor Neiswanger.

180. Economics of Public Utilities.—Twice a week; both semesters. *One unit.* (Not given in 1939-1940.) Associate Professor Gray.

192. Economics of Transportation.—Twice a week; both semesters. *One unit.* Associate Professor Locklin.

Courses for Graduates and Advanced Undergraduates

3. Money, Credit, and Banking.—Three times a week; either semester. Professor Lee.

4. History of Money, Credit, and Banking Institutions, with Particular Reference to the United States.—Three times a week; second semester. (Not given in 1939-1940.)

5. History and Theory of Money, Credit, and Banking Institutions with Particular Reference to the United States.—Twice a week; second semester.

6. Principles and Practices of Investment Banking.—Three times a week; second semester. Professor Lee.

8. Foreign Exchange and the Money Market.—Three times a week; second semester.

9. Advanced Theory and Practice of Banking.—Three times a week; first semester. Professor Lee.

10. Corporation Finance and Management.—Three times a week; either semester. Associate Professor Gray and others.

11. Industrial Consolidation.—Development; plans for controlling trusts. Three times a week; both semesters. Associate Professor Brown.

19. Economic Development of the United States (1820-1860).—Twice a week; first semester. Dean Thompson.

20. Economic Development of the United States since 1860.—Twice a week; second semester. Dean Thompson.

23. Economic Problems.—Three times a week; first semester. Professor Lee.

24. Economic Development of Modern Europe.—Three times a week; second semester.

25. Economic History of England.—Three times a week; first semester. Assistant Professor Whittaker.

29. International Commerce and Commercial Policies.—Three times a week; second semester. Professor Litman.

30. World Markets.—Three times a week; second semester. Professor Litman.
31. Organization of International Commerce.—Three times a week; first semester. Professor Litman.
36. Investments.—Three times a week; second semester. Associate Professor Brown.
41. Labor Problems.—Three times a week; first semester.
42. Trade Unionism.—Three times a week; second semester.
43. Personnel Administration.—Three times a week; both semesters.
44. Socialism and Economic Reform.—Three times a week; either semester. Assistant Professor Blodgett.
51. Public Finance.—Three times a week; either semester. Professor Hunter.
52. State and Local Finances of Illinois.—Three times a week; second semester. Assistant Professor Allen.
55. Economics of Insurance (Life).—Three times a week; first semester. Associate Professor Dickinson.
56. Economics of Insurance (Property).—Three times a week; second semester. Associate Professor Dickinson.
61. Economic Theory.—Three times a week; both semesters.
65. Social Control of Business.—Twice a week; first semester. Associate Professor Gray.
71. Economic Statistics.—Three times a week; first semester. Assistant Professor Neiswanger.
72. Economic Statistics (Business Barometers).—Three times a week; second semester. Assistant Professor Neiswanger.
81. Principles of Public Utilities.—Three times a week; first semester. Associate Professor Gray.
83. Public Utility Rates and Regulation.—Three times a week; second semester. Associate Professor Gray.
93. Industrial Traffic Management.—Three times a week; second semester. Associate Professor Locklin.
94. Ocean Shipping.—Three times a week; first semester. Professor Litman.
95. Railroad Rates.—Three times a week; first semester. Associate Professor Locklin.
96. Transportation Problems.—Three times a week; second semester. Associate Professor Locklin.
97. Railroad Finance.—Three times a week; second semester. (Not given in 1939-1940.) Associate Professor Locklin.
98. Railroad Organization.—Twice a week; first semester. (Not given in 1939-1940.) Associate Professor Locklin.
99. Current Economic Problems.—Twice a week; first semester. Dean Thompson.

EDUCATION

In addition to complying with the general rules of the Graduate School, candidates for the master's degree in education must meet the following requirements: (1) Education 125 is a required course for all students; (2) for students who have not taken a course in the history of education, Education 11 or Education 30 is required; (3) Education 6 and 25, or their equivalents, are prerequisites for all graduate courses.

No student is recommended to the Dean of the Graduate School for formal admission to candidacy for the master's degree until at least four units

of the eight ordinarily required for the degree have been completed satisfactorily. In the case of a student who has been allowed to waive the thesis (see page 13) two papers will be required. The first shall be written during the first half of the student's residence and shall be an important factor in determining his further status in the department. The second shall be written during the second half of the student's period of residence.

Courses for Graduates

101. Philosophy of Education.—Once a week; two hours; first semester. *One unit.* Assistant Professor Browne.

102. Research in History of American Education.—Arrange; both semesters. *One unit.* Professor Seybolt.

104. Educational Administration.—Once a week; two hours; both semesters. *One unit.* Professor Weber.

105. Elementary School Organization and Administration.—Once a week; two hours; second semester. Professor Reeder.

106. Organization of Junior and Senior High Schools.—Once a week; two hours; first semester. *One unit.* Professor Clement.

110. Recent Research in the Teaching of High School Subjects.—Once a week; two hours; both semesters. *One unit.* Professor Monroe.

115. Education and the Problems of Personality.—Once a week; two hours; second semester. *One unit.* Professor Griffith.

119. Trends and Techniques in Curriculum Making.—Once a week; two hours; first semester. *One unit.* Associate Professor Smith.

120. Supervision of Junior and Senior High Schools.—Once a week; two hours; second semester. *One unit.* Professor Clement.

121. Educational Measurements.—Once a week; two hours; second semester. *One unit.* Associate Professor Odell.

122. Educational and Vocational Guidance.—Once a week; two hours; first semester. *One unit.* Assistant Professor Finch.

123. Educational Statistics.—Once a week; two hours; first semester. *One unit.* Associate Professor Odell.

124. Techniques in Educational Research.—Once a week; two hours; both semesters. *One unit.* Professor Monroe.

125. Advanced Educational Psychology.—Once a week; two hours; both semesters. *One unit.* Professor Griffith, Associate Professor Potthoff.

128. The Junior High School.—Once a week; two hours; first semester. *One unit.* (Not given in 1939-1940.) Professor Clement.

129. The Junior College.—Once a week; two hours; second semester. *One unit.* (Not given in 1939-1940.) Professor Clement.

131. Study of Textbooks and Other Materials of Instruction in Secondary Schools.—Once a week; two hours; first semester. *One unit.* Professor Clement.

132. Diagnostic and Remedial Work in Arithmetic.—Once a week; first semester. *One unit.* (Not given in 1939-1940.)

133. Problems of Instruction and Supervision in Secondary Education.—For interns only. Once a week; first semester. *One unit.* Professor Clement, Assistant Professor Sanford.

134. The Teaching and Supervision of Reading and the Language Arts in the Elementary School.—Once a week; first semester. *One unit.* Professor Reeder.

135. The Teaching and Supervision of the Social Studies in the Elementary School.—Once a week; first semester. *One unit.* Professor Reeder.

139. Seminar in Curriculum Problems.—Once a week; two hours; second semester. *One unit.* Associate Professor Smith.

148. Psychology of the Secondary School Subjects.—Once a week; two hours; first semester. *One unit.* (Not given in 1939-1940.)

150. Thesis.—Both semesters. *One or two units.* Dean Benner and others.

170. Public School Finance and Business Administration.—Once a week; two hours; first semester. *One unit.* Professor Weber.

180. Seminar in Elementary Education.—Once a week; two hours; second semester. *One unit.* Professor Reeder.

184. Seminar in School Administration.—Once a week; two hours; second semester. *One unit.* Professor Weber.

185. Seminar in Educational Psychology.—Arrange; both semesters. *One unit.* Professor Griffith, Associate Professor Potthoff, Assistant Professors Finch, Barker.

186. Seminar in Secondary Education.—Once a week; two hours; both semesters. *One-half unit.* (Not given in 1939-1940.) Professor Clement.

187. Seminar in Industrial Education and Guidance.—Once a week; two hours; first semester. *One unit.* Professor Mays.

188. Analysis and Organization of Subject Matter in Industrial Education.—Once a week; two hours; second semester. *One unit.* Professor Mays.

189. Administration and Supervision of Industrial Education.—Once a week; two hours. (Not given in 1939-1940.) *One unit.* Professor Mays.

190. Research in Education.—Arrange; both semesters. *One unit.* Dean Benner and others.

Courses for Graduates and Advanced Undergraduates

11. Ancient and Medieval Education.—Twice a week; second semester. Professor Seybolt.

18. Educational Measurements.—Three times a week; first semester. Associate Professor Odell.

21. Supervision of Elementary Education.—Three times a week. (Not given in 1939-1940.) Assistant Professor Browne.

30. History of American Education.—Twice a week; first semester. Professor Seybolt.

31. Introduction to Modern Theories in Education.—Three times a week; second semester. (Not given in 1939-1940.) Assistant Professor Browne.

41. Principles of Vocational Education.—Three times a week; second semester. Professor Mays.

42. Special Education (Superior and Handicapped Children).—Once a week. (Not given in 1939-1940.) Assistant Professor Dolch.

43. Mental Tests.—Three times a week; second semester. Associate Professor Odell.

45. Genetic Psychology for Teachers.—Three times a week; first semester. (Not given in 1939-1940.) Professor Griffith.

46. Recent Developments in the Teaching of Elementary School Subjects.—Once a week; first semester. Assistant Professor Dolch.

52. Part-Time and Evening Schools.—Three times a week; first semester. Professor Mays.

53. Problems of Industrial Education.—Three times a week; first semester. Professor Mays.

55. Problems of Vocational Guidance.—Three times a week; second semester. Professor Mays.

ELECTRICAL ENGINEERING

The prerequisite for graduate work in electrical engineering is the equivalent of the undergraduate courses required for the degree of Bachelor of Science in electrical engineering in the branches of the subject in which registration is desired. Graduate students who wish to take a minor in electrical engineering must have had differential and integral calculus, and one year's work in college physics. Courses offered to junior and senior students in electrical engineering are open for minor credit to students majoring in other departments who have the proper prerequisites.

Courses for Graduates

101. Advanced Courses in Alternating Currents.—Both semesters. *One-half to two units:*
   (a) Graduate Seminar.—Professor Paine.
   (b) Circuit Transients.—Professor Knight.
   (c) Machine Transients.—Associate Professor Keener.
   (d) Symmetrical Components.—Professor Kraehenbuehl, Assistant Professor Faucett.

102. Electric Waves, Oscillations, and Transients.—Both semesters. *One-half to two units:*
   (a) Theory of Electric Waves, Oscillations, and Transients.—Professor Reich.
   (b) Demonstration Lectures.—Professor Reich.
   (c) Theory of Energy Radiation.—Professor Brown.
   (d) Principles of Television Engineering.—Professor Brown.

103. Electric Design.—Both semesters. *One to three units:*
   (a) Power Plant Design.—Professor Paine.
   (b) Machine Design.—Professor Paine.
   (c) Illumination Practice and Design.—Professor Kraehenbuehl.

104. Vacuum Tubes and Electronic Control.—Both semesters. *One unit:*
   (a) Theoretical Electronics.—Professor Reich.
   (b) Vacuum Tubes and Amplifiers.—Professor Reich.
   (c) Photoelectric Cells, Gaseous Control Tubes, and Inverters.—Professor Reich.

105. Electrical Engineering Research.—Both semesters. *One to three units.* Professors Paine, Tykociner, Knight, Reich, Brown, Kraehenbuehl; Associate Professor Keener; Assistant Professor Faucett.

ENGLISH LANGUAGE AND LITERATURE

Students who enter on graduate work with English as their major subject are required to give evidence of their ability to write good English. They must present the equivalent of fourteen hours of undergraduate work in English literature, the required college work in rhetoric, and the equivalent of four semesters of college work in Latin, or in Greek, or in French, or in German. After the first year of graduate work a knowledge of French and German is indispensable.

Students making English their minor may be admitted to such courses as in the judgment of the instructor in charge they are qualified to pursue.

The Degree of Master of Arts in English.—In addition to complying with the general rules of the Graduate School, candidates for the degree of Master of Arts in English must comply with the following rules of the Department of English: (1) They must choose most of their work from the group of courses described as "for graduates," and (2) must pass a general examination.

The Degree of Doctor of Philosophy in English.—Candidates for the degree of Doctor of Philosophy in English may expect to be examined on the entire field of the English language and literature. They are urged, furthermore, to acquaint themselves as fully as possible with the history and philosophy of the period in which their main interest lies, and with the foreign languages and literature most closely related to English and that period.

Courses for Graduates

101. Research in Special Topics.—*One to two units.* Professors Hillebrand, Bernbaum, Paul, T. W. Baldwin, Graham, Jones, Jefferson, Fletcher, Larsen, Parry; Associate Professor Landis; Assistant Professors Rinaker, Herrick.

107. Old Norse.—Introduction to the language; grammar; reading of the Prose Edda in part, and selections from the sagas. Twice a week; both semesters. *One unit.* Professor Larsen.

108. Old English (Anglo-Saxon).—Three times a week; first semester. *One unit.* Professor Larsen.

109. Old English (Anglo-Saxon).—Beowulf. Three times a week; second semester. *One unit.* Professor Jones.

110. Old English (Anglo-Saxon) Poetry.—Twice a week; first semester. *One unit.* (Not given in 1939-1940.)

111. Seminar in Caedmon and Cynewulf.—Twice a week; first semester. *One unit.* (Not given in 1939-1940.) Professor Jones.

120. History and Principles of Literary Criticism.—Twice a week; both semesters. *One unit.* (Not given in 1939-1940.) Professor Jefferson.

125. Middle English.—Twice a week; second semester. *One unit.* Professor Larsen.

128. Literature of the Sixteenth Century.—Twice a week; both semesters. *One unit.* Professor Jones.

129. English Literature from the Norman Conquest to 1400.—Twice a week; both semesters. *One unit.* (Not given in 1939-1940.) Professor Jones.

130. Tragedy.—Twice a week; both semesters. *One unit.* Professor Hillebrand.

135. Problems in American Literature.—Twice a week; both semesters. *One unit.* Professor Paul.

138. The Romantic Movement.—Twice a week; both semesters. *One unit.* Professor Bernbaum.

140. Investigations in Modern English Literature.—(For second-year and third-year graduate students who are preparing theses for the doctor's degree.) Once a week; three hours; both semesters. *One to three units.* (May be taken in successive years.) Professor Bernbaum.

141. The Seventeenth Century.—Twice a week; both semesters. *One unit.* Professor Fletcher.

143. Seminar in the History and Theory of Prose Fiction.—Once a week; two hours; both semesters. *One unit.* Professor Bernbaum.

145. English Literature in the Eighteenth Century.—Once a week; two hours; both semesters. *One unit.* Professor Graham.

146. Milton.—Once a week; two hours; both semesters. *One unit.* Professor Fletcher.

147. Shakespeare and Elizabethan Drama.—Critical study of the chief plays. Twice a week; both semesters. *One unit.* Professor T. W. Baldwin.

148. Seminar in Elizabethan Drama.—Twice a week; first semester. *One unit.* (Not given in 1939-1940.) Professor T. W. Baldwin.

149. Development of Tudor Drama.—Twice a week; both semesters. *One unit.* (Not given in 1939-1940.) Professor T. W. Baldwin.

151. Studies in the History of the Eighteenth Century Novel.—Twice a week; first semester. *One unit.* (Not given in 1939-1940.) Associate Professor Secord.

157. Seminar in Spenser.—Twice a week; first semester. *One unit.* Professor Jones.

Courses for Graduates and Advanced Undergraduates

3. Poetry of Milton.—Three times a week; second semester. Professor Fletcher.

17. History of the English Language.—Three times a week; first semester. Professor Larsen.

25. Chaucer.—Three times a week; first semester. Professor Jones.

26. Spenser.—Three times a week; second semester. Professor Jones.

34. Dr. Johnson and His Circle.—Three times a week; first semester. Assistant Professor Rinaker.

35. The English Drama (Previous to Shakespeare).—Three times a week; first semester. Professor T. W. Baldwin.

36. The English Drama (Exclusive of Shakespeare) from 1600 to 1700.—Three times a week; second semester. (Not given in 1939-1940.) Professor Hillebrand.

38. Development of Arthurian Romance.—Three times a week; second semester. Professor Parry.

54a–54b. Introduction to Comparative Literature.—Three times a week; both semesters. Professors Oldfather, Aron, Carnahan, Van Horne, Parry; Associate Professors Hamilton, Landis; Dr. Busey.

55a–55b. Survey of English Literature.—Three times a week; both semesters. Professor Parry, Assistant Professor Herrick.

SPEECH

Students who enter on graduate work with speech as their major must give evidence of their ability to write good English, and must present the equivalent of fourteen hours of undergraduate work in speech.

Students making speech their minor may be admitted to such courses as in the judgment of the instructor in charge they are qualified to pursue.

Candidates for the degree of Master of Arts in speech, in addition to complying with the general rules of the Graduate School, must (1) pass a general examination and (2) prepare a thesis on some subject approved by the faculty.

Courses for Graduates

101. Research in Special Topics.—Open to candidates for the master's degree in Speech. *One to two units.* Associate Professor Parrish, Assistant Professor Windesheim, Dr. Nelson.

114. Seminar in Speech Correction.—Twice a week; both semesters. *One to two units.* Dr. Nelson.

119. Seminar in Speech Science.—Problems in the physics and physiology of speech. Twice a week; both semesters. *One unit.* Assistant Professor Windesheim.

121. History of Rhetorical Theory.—Twice a week; both semesters. *One unit.* Associate Professor Parrish.

Courses for Graduates and Advanced Undergraduates

14. Methods of Speech Correction.—Three times a week; both semesters. Dr. Nelson.
17. Advanced Interpretation.—Three times a week; second semester. Associate Professor Parrish.
18. Pronunciation.—Methods of voice improvement; the sounds of English studied by means of the International Phonetic Alphabet. Three times a week; first semester. Associate Professor Parrish.
19. Speech Science.—Principles of physics involved in the production of speech sounds. Three times a week; first semester. Assistant Professor Windesheim.
20. Speech Science.—Physiology and psychology of human speech. Three times a week; second semester. Assistant Professor Windesheim.

ENTOMOLOGY

The prerequisite for graduate work in entomology is two years of undergraduate biology, including zoology and entomology. Entrance on major work in entomology requires at least six hours of entomology. A reading knowledge of French and German is desirable by the beginning of the second year.

Courses for Graduates

100. Research.—Once or twice a week; both semesters. *One-half to four units.*
   (a) Morphology and Embryology of Insects.—Professor Hayes.
   (b) Economic Entomology.—Professor Metcalf.
   (c) Systematic Entomology.—Professor Metcalf, Associate Professor Balduf.
   (d) Biology and Ecology of Insects.—Professor Metcalf, Associate Professor Balduf.
107. Insect Anatomy.—Lectures and laboratory. Three times a week; both semesters. *One unit.* (Given in alternate years; not given in 1939-1940.) Professor Hayes.

Courses for Graduates and Advanced Undergraduates

6. Special Problems.—Once or twice a week; both semesters. Members of the department.
8c. Pests of Man and Domestic Animals and Disease Carriers.—Lectures and laboratory. Three times a week; second semester. (Not given in 1939-1940.) Professor Metcalf.
10. Morphology and Taxonomy of Immature Insects.—Lectures and laboratory. Three times a week; both semesters. (Given in 1939-1940 and in alternate years.) Professor Hayes.
20. Insect Control.—Lectures and laboratory. Three times a week; first semester. Professor Metcalf.
21. Insect Bionomics.—Lectures and readings. Three times a week; second semester. (Given in alternate years; not given in 1939-1940.) Professor Metcalf.

FRENCH

A student entering on graduate work for an advanced degree must have had at least three years of college work in French, including one advanced literary course.

Students who enter with a knowledge of Latin and of a second Romance language, together with a reading knowledge of German, will find their work for an advanced degree greatly facilitated.

Courses for Graduates

101. Old French Literature.—Twice a week; both semesters. *One unit.* Professor Oliver.

102. Villon, Rabelais, Montaigne, La Pléiade.—Twice a week; both semesters. *One unit.* Professor Will.

103. Seventeenth Century Literature.—Twice a week; both semesters. *One unit.* Professor Oliver.

104. Eighteenth Century Literature.—Twice a week; both semesters. *One unit.* (Not given in 1939-1940.) Professor Oliver.

127. French Romanticism.—Twice a week; both semesters. *One unit.* (Not given in 1939-1940.) Professor Carnahan.

128. Origin and Development of the Novel in France.—Twice a week; both semesters. *One unit.* Professor Carnahan.

129. Research Problems in French Romanticism.—Twice a week; both semesters. *One unit.* Professor Carnahan.

132. French Symbolism in Prose and Verse and the English and American Influences.—Twice a week; both semesters. *One unit.* (Not given in 1939-1940.)

144. French Realism and Naturalism.—Twice a week; both semesters. *One unit.* Professor Jackson.

145. Doctrines Littéraires et Courants d'Idées Contemporains.—(In French.) Twice a week; both semesters. *One unit.* (Not given in 1939-1940.)

175. Old French Phonology and Morphology.—Twice a week; both semesters. *One unit.* (Not given in 1939-1940.) Professor Oliver.

195. Seminar.—Research work in special topics. Both semesters. *One to two units.* Professors Jackson, Oliver, Carnahan, Will; Assistant Professor Jacob.

Courses for Graduates and Advanced Undergraduates

10a–10b. General Survey of French Literature.—Three times a week; both semesters. Professor Carnahan.

17a–17b. French Drama of the Nineteenth Century.—Twice a week; both semesters. Professor Will, Associate Professor Hamilton.

24a–24b. French Drama of the Seventeenth and Eighteenth Centuries.—Three times a week; both semesters. Professor Oliver.

32a–32b. French Novel of the Nineteenth Century.—Three times a week; both semesters. Assistant Professor Jacob.

33a–33b. La Littérature Contemporaine.—(In French.) Twice a week; both semesters. Assistant Professor Jacob.

34a–34b. Balzac and the Social Novel.—Three times a week; both semesters. Professor Jackson.

35a-35b. Civilisation Française. (Développement de la Culture Française).—(In French.) Twice a week; both semesters. (Not given in 1939-1940.)

GENETICS

Those desiring a general training in genetics may take a major or minor in botany or zoology. Those desiring to approach agricultural problems through

genetics may take a major or minor in agronomy, horticulture, or animal husbandry. For courses in the subject see departments of Agronomy, Animal Husbandry, Botany, Horticulture, and Zoology.

GEOLOGY AND GEOGRAPHY

For graduate work in geology the student must usually have had at least a major in geology and an acceptable field training. A major consists of 20 hours in geology, exclusive of Geology 1, 1a, 43, and 44, and inclusive of at least five hours of courses not open to freshmen or sophomores. The following undergraduate courses are recommended: Geology 2, 9, 15, 16, 20, 24, 33, and 49. Graduate students in other departments may nevertheless be admitted to certain graduate courses in geology. A candidate for the master's degree must pass a general written examination toward the close of the second semester of residence, covering the general fields of geology as embraced in the courses listed above and in the graduate courses taken.

For graduate work in geography the student must have had at least the equivalent of a major in geography. A major consists of 20 hours in geography, exclusive of Geography 1, and inclusive of at least five hours of courses not open to freshmen. Candidates for the master's degree should obtain from the department a copy of special regulations governing a preliminary examination for transfer students and a comprehensive examination near the close of the second semester of residence for all candidates.

GEOLOGY

Courses for Graduates

101. Advanced Crystallography.—The forms and physical properties of crystallized bodies. Optical properties. Projections and measurements in preparation for x-ray, chemical, ceramic, and geological research. Twice a week; both semesters. *One unit.* Professor Quirke.

102. Igneous Petrography.—Lectures; laboratory. Twice a week; both semesters. *One unit.* (Given in 1939-1940 and in alternate years.) Professor Quirke.

123. Geology of the Oceans.—A study of the recent developments in the geological exploration of the oceans and the bearing which the discoveries have on historical and stratigraphic geology. Three times a week; first semester. *One unit.* (Given in 1939-1940 and in alternate years.) Professor Shepard.

125. Sedimentation.—The interpretation of sedimentary rocks in terms of their origin. Three times a week; first semester. *One unit.* (Given in 1939-1940 and in alternate years. Associate Professor Wanless.

126. Sedimentary Petrology.—Description of sedimentary rocks and cuttings; various methods of analysis of sedimentary rocks and interpretation of results. Two or three times a week; second semester. *One unit.* (Given in 1939-1940 and in alternate years.) Associate Professor Wanless.

134. Advanced Studies in Geology.—Studies in metamorphism, pre-Cambrian geology, ore deposition, advanced paleontology, geophysical prospecting, and other subjects, to be arranged with members of the department. Both semesters. *One-half to four units.*

135. Research.—Once a week; both semesters. *One-half to four units.* Members of the department.

142. Stratigraphic Paleontology: Paleozoic.—The invertebrate index fossils of the successive geologic formations. Three times a week; first semester. *One unit.* Associate Professor Sutton.

143. Stratigraphic Paleontology: Mesozoic and Cenozoic.—Stratigraphic study of the formations with a consideration of characteristic fossils. Three times a week; second semester. *One unit.* Associate Professor Sutton.

145. Micropaleontology.—Classification of microorganisms: foraminifera, ostracodes, conodonts, scolecodonts, and other major groups. Stratigraphic correlation. Three times a week; both semesters. *One unit.* (Given in alternate years; not given in 1939-1940.) Assistant Professor Scott.

151. Advanced Dynamic Geology.—A critical analysis of geologic processes and their results; the materials and structure of the earth; problems of geologic interpretations. Three times a week; second semester. *One unit.* (Given in alternate years; not given in 1939-1940.) Professor Shepard.

152. Advanced Historical Geology.—Cosmogeny; the record of diastrophism; the development of the continents and oceans; the relationship between oceanic fluctuations and organic differentiation and evolution; physiographic, climatic, and organic history. Three times a week; first semester. *One unit.* (Given in 1939-1940 and in alternate years.) Associate Professor Sutton.

160. Petroleum Geology.—Three times a week; both semesters. *One unit.* (Given in alternate years; not given in 1939-1940.) Professor De Wolf.

Courses for Graduates and Advanced Undergraduates

9. Invertebrate Paleontology.—Fossil groups in biological sequence. Three times a week; first semester. Associate Professor Sutton.

15. Structural Geology.—Rock deformation and its results. Three times a week; first semester.

16. Stratigraphy.—Fossil faunas, with special reference to Paleozoic invertebrates, correlation, and stratigraphy. Three times a week; second semester. Associate Professor Sutton.

24. Field Methods and Mapping.—Once a week and three or four one-day field trips and one longer field trip; second semester. (Given in 1939-1940 and in alternate years.) Associate Professor Wanless.

33. Geologic Maps.—Studies of geologic and topographic maps with reference to interpretations of stratigraphy, structure, and history. Three times a week; first semester. (Given in 1939-1940 and in alternate years.) Associate Professor Wanless.

49. Microscopic Mineralogy.—Five times a week; second semester. Dr. Chapman.

60a–60b. Introduction to Research.—Two or four times a week; both semesters. Members of the department.

61a-61b. Applied Petroleum Geology.—Primarily for students in the College of Engineering. Three times a week; both semesters. Professor De Wolf.

95. Economic Geology.—The nature, occurrence, origin, and uses of coal, oil, building stones, and bedded deposits of economic importance. Three times a week; first semester. (Given in 1939-1940 and in alternate years.) Professor De Wolf.

96. Economic Geology.—The nature, occurrence, and origin of metalliferous deposits; theories of ore deposition. Three times a week; second semester. (Given in 1939-1940 and in alternate years.) Professor Quirke.

GEOGRAPHY

Courses for Graduates

134. Advanced Studies in Geography.—Studies in geographical subjects. Both semesters. *One-half to four units.* Professor Blanchard, Assistant Professor Page.

135. Research.—Once a week; both semesters. *One-half to four units.* Professor Blanchard, Assistant Professor Page.

Courses for Graduates and Advanced Undergraduates

8. Geography of Europe.—Three times a week; first semester. Professor Blanchard.

10. Geography of Africa.—Three times a week; second semester. (Given in alternate years; not given in 1939-1940.) Dr. Crist.

11. Geography of Asia.—Three times a week; second semester. (Given in 1939-1940 and in alternate years.) Dr. Booth.

14a. Climate of the Continents.—Three times a week; second semester. (Given in alternate years; not given in 1939-1940.) Assistant Professor Page.

53. Production of the Great World Staples.—Three times a week; second semester. (Given in 1939-1940 and in alternate years.) Professor Blanchard.

54. Advanced Commercial Geography.—Three times a week; second semester. (Given in alternate years; not given in 1939-1940.) Professor Blanchard.

60a–60b. Introduction to Research.—Two or four times a week; both semesters. Members of the department.

GERMAN

Students desiring to take German as a major are required to have finished successfully a four-year course of undergraduate work in German, or its equivalent. They are also required to be familiar with the principal works of the writers of the classical and modern periods of German literature, to show a general knowledge of the history of German literature, and to be able to follow lectures in the German language.

Of collateral subjects, a reading knowledge of French is important and is required for advanced graduate work. Some acquaintance with Latin and with German history is highly desirable.

Courses for Graduates

101. Seminar in Modern German Drama.—Twice a week; both semesters. *One unit.* Professor Aron.

Note.—Course 101 is arranged in a three-year rotation: Seminar in the German Novel, 1940-1941; Seminar in Goethe and Schiller, 1941-1942. Course S101 is arranged in a two-year rotation: Seminar in the German Lyric, Summer of 1939, Professor Aron; Seminar in Volkskunde with Special Reference to the Volkslied, Summer of 1940, Professor Williams.

102. Thesis.—Both semesters. *One-half to two units.* Professors Aron, Williams, Associate Professor Geissendoerfer, Assistant Professors Jehle, Penzl.

104. Gothic.—Grammar and literature. Twice a week; first semester. *One unit.* Assistant Professor Penzl.

105. Old High German.—Grammar and interpretation of the oldest literary documents. Twice a week; second semester. *One unit.* Professor Williams.

113. German Literature of the Fifteenth and Sixteenth Centuries.—Twice a week; first semester. *One unit.* Professor Williams.

117. German Literature of the Seventeenth and Eighteenth Centuries.—Twice a week; both semesters. *One unit.* (Given in alternate years; not given in 1939-1940.) Professor Aron.

121. Walther von der Vogelweide.—Twice a week; second semester. *One unit.* (Alternates with course 121a.) Professor Williams.

121a. The Nibelungenlied.—Twice a week; second semester. *One unit.* (Alternates with course 121; not given in 1939-1940.) Professor Williams.

125. History of the German Language.—Twice a week; second semester. *One unit.* Assistant Professor Penzl.

127. German Romanticism.—Twice a week; second semester. *One unit.* Associate Professor Geissendoerfer.

Courses for Graduates and Advanced Undergraduates

19a–19b. Goethe's Faust.—The Faust legend and early Faust books and plays; the genesis of Goethe's *Faust*; reading of both parts. Twice a week; both semesters. Associate Professor Geissendoerfer.

26a. German Literature to 1800.—Three times a week; first semester. Professor Aron.

26b. German Literature since 1800.—Three times a week; second semester. Professor Aron.

31. Middle High German.—Twice a week; first semester. Professor Williams.

32. History of German Civilization.—Three times a week; second semester.

HISTORY

Graduate work in history requires two years of college work in this subject, or sixteen semester hours, which should ordinarily include introductory courses in European and American history. Linguistic preparation is important, especially in French and German. For medieval history some knowledge of Latin is essential and Spanish is useful for certain fields of American history.

Advanced courses in history at the University of Illinois are of three kinds: (1) Courses for information and guidance in general reading. (2) Instruction in methodology, historiography, and bibliography. A part of this work (in course 103) is required of all graduate students in history during their first year. (3) Seminar courses for the study of special fields with a view primarily to training in the methods of historical criticism and research.

Illinois Historical Survey.—Students of history have an opportunity to pursue research in western history in connection with the Illinois Historical Survey, which is an organization for the purpose of carrying on systematic studies in the history of Illinois. Through the use of materials collected by this survey, graduate students in the department have been given useful training in the study of manuscript as well as of printed material.

Higher Degrees in History.—The following statement regarding the specific requirements for higher degrees in history is subject to the general requirements of the Graduate School.

Master of Arts

Each candidate for this degree will ordinarily be required to pass a general written examination early in the year and will be expected to devote special attention to two of the following fields: ancient history; medieval history of continental Europe; modern history of continental Europe; English history; American history; Latin-American history; the Near East; the Far East. The candidates are expected to have a general knowledge of historical method (see

course 103). The department further requires a working knowledge of one important foreign language, ordinarily French or German.

Doctor of Philosophy

Major Requirements.—A candidate who selects history as his major subject may offer himself for examination in any four of the fields indicated below, stating also the particular field among these four in which he wishes to specialize and in which his thesis is to be written:

1. Ancient history. 2. Medieval history and institutions of continental Europe, to the close of the thirteenth century. 3. Continental Europe from 1300 to 1648. 4. Continental Europe and its dependencies since 1648 (except as included in 5 and 6). 5. The history of England and its dependencies (not including America before 1783). 6. The history of the United States. 7. The history of Latin America. This enumeration of fields is not to be regarded as excluding the possibility of accepting others as may be determined by the department in individual cases.

Minor Subjects.—A candidate for the doctorate in history may select as his first minor one of the divisions of the field of history listed above which is not offered as a part of his major. He should preferably, however, select his minors from subjects offered by other departments. The following list of suitable minors is intended to be suggestive rather than exhaustive or compulsory.

Political Science.—(Any two acceptable for a first minor; any one, for a second minor.) 1. International law and diplomacy. 2. Modern government. 3. Municipal government. 4. Constitutional and administrative law and jurisprudence. 5. Political theory.

Economics and Sociology.—(Any two acceptable for a first minor; any one, for a second minor.) 1. Economic history. 2. Economic theory. 3. Public and private finance. 4. Social reform. 5. Principles of sociology.

Philosophy and Education.—(Any two acceptable for a first minor; any one, for a second minor.) 1. History of ancient and medieval philosophy. 2. History of modern philosophy. 3. History of education.

Literature.—Some division of the history of literature which may be either comparative literature of a limited period or the literature of a particular country for a more extended period as may be agreed upon in each case.

Courses for Graduates

101. Seminar in American History.—Once a week; two hours; both semesters. *One unit.* Semester I: Introduction to research in American history. Professor Robertson. Semester II: Guidance in the investigation of selected topics. Professor Randall.

102. Seminar in English History.—The Tudor period, 1540-1550, political and social developments. Once a week; two hours; both semesters. *One unit.* Professor Dietz.

103. Studies in Historical Method.—Required of all candidates for an advanced degree in history who do not present evidence of similar training elsewhere. Twice a week; first semester. *One unit.* Professor Randall.

104. Seminar in Modern History.—Once a week; two hours; both semesters. *One unit.* Professor Lybyer.

105. Research in Special Topics.—Guidance in writing theses for advanced degrees. *One to two units.* Professors Robertson, Lybyer, Pease, Jones, Randall, Dietz, Swain, Rodkey; Associate Professor Shannon; Assistant Professors Dunbar, Werner, Stearns, Erickson.

106. Seminar in the History of the Middle Ages.—Arrange hours; both semesters. *One unit.* (Not given in 1939-1940.)

117. Social History of the United States since 1865.—Studies in the social aftermath of the Civil War: agrarian unrest; immigration, urbanization, intellectual interests. Once a week; two hours; both semesters. *One unit.* Associate Professor Shannon.

122. History of the West.—An intensive study of the westward movement, 1740-1765. Once a week; two hours; both semesters. *One unit.* Professor Pease.

126. Spain in Europe and America, 1750-1870.—Bibliography, historiography, and topical reports. Arrange hours; first semester. *One unit.* Professor Robertson.

127. Inter-American Relations.—Relations of the Latin-American nations with each other and with the United States. The Monroe Doctrine, intervention, etc. Arrange hours; second semester. *One unit.* Professor Robertson.

133. Studies in the History of Europe in the Nineteenth Century.—Once a week; two hours; both semesters. *One unit.* Professor Rodkey.

138. Studies in the History of France in the Sixteenth and Seventeenth Centuries.—Arrange hours; both semesters. *One unit.* Professor Jones.

150. Seminar in Ancient History.—Arrange hours; both semesters. *One unit.* (Not given in 1939-1940.) Professor Swain.

Courses for Graduates and Advanced Undergraduates

16a–16b. The American Colonies in the Eighteenth Century and the Transition to National Life and Organization.—Three times a week; both semesters. Assistant Professor Dunbar.

17a–17b. Social and Economic Forces in the United States in the Nineteenth Century.—Three times a week; both semesters. Associate Professor Shannon.

19. History of American Immigration, Colonial and National Periods.—Twice a week; second semester. Assistant Professor Werner.

20. The South, Old and New.—Three times a week; first semester. Professor Randall.

21. History of the United States since 1877.—Three times a week; second semester. Professor Randall.

22a–22b. History of the West, 1634-1830.—Twice a week; both semesters. Professor Pease.

25. The Civil War and the Reconstruction.—Three times a week; first semester. Associate Professor Shannon.

26. History of the Latin-American Colonies.—Three times a week; first semester. Professor Robertson.

27. History of Latin America from the Wars of Independence to the Present Time.—Three times a week; second semester. Professor Robertson.

29. America and Europe, 1776-1900.—Foundations of international intercourse, with particular reference to the Latin-American colonies and states. Three times a week; second semester. Professor Robertson.

32a–32b. History of Europe since 1878.—Three times a week; both semesters. Professor Lybyer.

34a–34b. Development of Modern Europe, 1648-1848.—Three times a week; both semesters. Professor Stearns.

36a–36b. History of the German People in Modern Times.—Three times a week; both semesters. Professor Rodkey.

37a–37b. History of Eastern and Southern Asia.—Twice a week; both semesters. (Not given in 1939-1940.) Professor Lybyer.

38a–38b. Development of the French Monarchy in the Later Middle Ages and in Early Modern Times, 1285-1648.—Three times a week; both semesters. (Not given in 1939-1940.) Professor Jones.

39a–39b. The Renaissance and the Protestant and Catholic Reformations.—The transition from medieval to modern ideals. Three times a week; both semesters. Professor Jones.

44a–44b. Constitutional History of England.—Three times a week; both semesters. Professor Dietz.

46a–46b. Social and Economic History of England, 1750-1939.—Three times a week; both semesters. (Not given in 1939-1940.) Professor Dietz.

47a–47b. History of England in the Later Middle Ages and in the Early Modern Period, 1399-1603.—Three times a week; both semesters. Professor Dietz.

55. History of the Ancient Greek States.—Three times a week; first semester. Professor Oldfather.

56. History of the Roman Republic.—Three times a week; second semester. Professor Oldfather.

57a–57b. Ancient Imperialism, Hellenistic and Roman.—Three times a week; both semesters. Professor Swain.

60. The United States in the World War.—Three times a week; second semester. Professor Pease.

62a–62b. Political and Constitutional Development of the United States.—Three times a week; both semesters. Professor Randall.

HOME ECONOMICS

As preparation for graduate work with a major in foods and nutrition the student must have had at least the equivalent of the foods and nutrition required in the undergraduate curriculum for the general major in home economics and, in addition, 3-5 hours in foods, dietetics, and nutrition; also quantitative chemical analysis.

In addition to graduate courses in home economics the student will offer, for a major in foods and nutrition, either Chemistry 50 or 40 and 41.

Graduate students who choose home economics as a minor for the degree of Doctor of Philosophy must have had adequate preliminary preparation in foods and nutrition and must include among the courses to be taken for the minor either Home Economics 41 and 103 or 35 and 105, or must have had their equivalent. Of the courses open to advanced undergraduates, selection may be made from courses 20, 33, 35, 39a, 39b, and 41.

Courses for Graduates

101. Home Economics.—Twice a week; second semester. *One unit.* Professor Bane and members of the department.

102. Research in Nutrition.—Both semesters. *One-half to three units.* Professor Outhouse.

103. Nutrition Seminar.—Once a week; both semesters. *One-half unit.* Professor Outhouse.

104. Research in Foods.—Both semesters. *One-half to three units.* Professor Woodruff.

105. Foods Seminar.—Once a week; both semesters. *One-half unit.* Professor Woodruff.

Courses for Graduates and Advanced Undergraduates

20. Physical Growth and Nutrition.—Twice a week; first semester. Professor Outhouse.

28. Organization and Management of the Home.—Twice a week; second semester. Professor Bane, Assistant Professor King.

31. Clothing.—Three times a week; second semester. Assistant Professor Whitlock.

33. Diet in Disease.—Three times a week; both semesters. Assistant Professor Barto.

35. Problems in Foods.—Three times a week; first semester. Professor Woodruff.

39a-39b. Readings in Food and Nutrition.—Once a week; both semesters. Professors Woodruff, Outhouse, Assistant Professor Barto.

41. Problems in Nutrition.—Three to five times a week; second semester. Professor Outhouse.

43a–43b. Problems in Textiles and Clothing.—Three times a week; both semesters. Assistant Professor Jacobsen, Miss Eades.

48. Institution Dietaries and Administration.—Three times a week; second semester. Assistant Professor Smith.

50. Costume Design.—Twice a week; second semester. Miss Eades.

51. Textiles.—Three times a week; second semester. Assistant Professor Jacobsen.

56. The Child and His Development.—Twice a week; both semesters. Assistant Professor Walls and members of the department.

57a-57b. Problems in Home Management.—Three times a week; both semesters. Professor Bane, Assistant Professor King.

62. Food and Nutrition.—Three times a week; first semester. Professor Outhouse.

HORTICULTURE

Graduate work is offered in the Department of Horticulture leading to the M.S. and Ph.D. degrees. Candidates may specialize for either degree in floriculture, olericulture, or pomology.

Twenty hours of collegiate work in horticulture and allied subjects are required for entrance upon major work, and twelve hours for minor work. The Department will waive certain of these requirements for some lines of major study if the student has had an equivalent preparation in the fundamental sciences. It is desirable when the major field of study is decided upon during the junior or senior year, to select the fundamental science courses accordingly, and if possible, to include in the undergraduate preparation the elementary courses in German or French.

Advanced work in botany, chemistry, entomology, agronomy, or agricultural economics may advantageously be taken with horticulture to make a well-balanced course of graduate study.

Courses for Graduates

103. Olericulture.—Once a week; both semesters. *One to two units.* Professor Lloyd.

105. Marketing Fruits and Vegetables.—See Agricultural Economics 135.

106. Olericulture Seminar.—Once a week; first semester. *One-fourth unit.* Professor Lloyd.

108. Pomology.—Three times a week; both semesters. *One to four units.*
(a) Pomology and Fruit Breeding.—Professor Dorsey.
(b) Pomological Physiology.—Professor Ruth.
(c) Small Fruits.—Professor Colby.
(d) Pomological Pathology.—Professor Anderson, Assistant Professor Thornberry.

115. Floriculture.—Once a week; both semesters. *One to two units.*
(a) Floricultural Problems.—Professor Dorner.
(b) Floricultural Physiology and Pathology.—Associate Professor Weinard.

120. Pomology Seminar.—Once a week; both semesters. *One-fourth unit.* Professors Dorsey, Ruth, Anderson.

125. Fruit Development.—Three times a week; first semester. *One unit.* Professor Dorsey.

130. Physiology of Fruit Production.—Three times a week; first semester. *One unit.* Professor Ruth.

135. Fruit and Vegetable Disease Research.—Three times a week; both semesters. *One unit.* Professor Anderson.

140. Advanced Small Fruit Culture.—Three times a week; second semester. *One unit.* Professor Colby.

Courses for Graduates and Advanced Undergraduates

12. Evolution of Horticultural Plants.—History, classification, and distribution of cultivated plants; modification under culture; variation; methods. Three times a week; first semester. (Given in 1939-1940 and in alternate years.) Professor Dorsey.

43. Floricultural Physiology.—Three times a week; first semester. Associate Professor Weinard.

44. Current Pomological Literature.—Once a week; both semesters. (*Note:* This course may be taken for four successive semesters, designated as Horticulture 44a, 44b, 44c, and 44d.) Professor Ruth.

45. Plant Nutrition.—Three times a week; second semester. Associate Professor Weinard.

46. Marketing Horticultural Products.—See Agricultural Economics 36.

47. Pomological Physiology.—The effects of environment upon fruits. The storage of fruits. Three times a week; first semester. (Given in alternate years; not given in 1939-1940.) Professor Ruth.

51. Fruit and Vegetable Diseases.—Three times a week; first semester. Professor Anderson.

LIBRARY SCIENCE

Before beginning work for the master's degree in library science, students must have acquired the degree of B.S. in Library Science, or its equivalent in an approved institution, with good scholastic records. They must also present approved experience, a reading knowledge of two modern foreign languages, one of which must be German or French, and recommendations as to professional promise.

A student may combine a major in library science with a minor in any special subject for which he is adequately prepared.

The thesis must be completed within three years after first registration therein, unless there is approval of a longer period based upon unusual contingencies.

Application forms may be secured from the Library School office.

Courses for Graduates

101. Thesis.—*One to two units.* The Director and others.

102. Seminar.—Both semesters. *One-half to four units.*

(b) University Library Administration.—*One unit.* (Not given in 1939-1940.)

(c) Publishers.—Once a week; two hours; first semester. *One unit.* Associate Professor Boyd.

(d) Special Libraries.—

(e) Individual Problems.—*One-half to one unit.* Associate Professors Bond, Boyd, and others.

(g) Social Trends.—Once a week; two hours; second semester. *One unit.* Dr. McDiarmid.

(h) Methods of Investigation in Librarianship.—Twice a week; first semester. *One-half unit.* Dr. McDiarmid.

103a-103b. Advanced Reference.—Twice a week; both semesters. *Three-fourths unit each semester.* Miss Phelps.

104a. Advanced Classification.—Once a week; two hours; first semester. *One-half unit.* Associate Professor Bond.

104b. Advanced Cataloging.—Once a week; two hours; second semester. *One-half to one unit.* (Not given in 1939-1940.)

Courses for Graduates and Advanced Undergraduates

7. History of Libraries.—Twice a week; second semester. *One-half unit.* (Not given in 1939-1940.)

9. History of Books and Printing.—Twice a week; second semester. *One-half unit.* (Not given in 1939-1940.)

13a. Government Publications.—Production, distribution, and use as reference material of United States federal publications. Twice a week; first semester. *Three-fourths unit.* Miss Phelps.

24a. Book Selection for Special Groups.—Foreign literature in translation. Twice a week; first semester. *Three-fourths unit.* Assistant Professor Hostetter.

24b. Book Selection for Special Groups.—Selection for socially maladjusted groups; retarded reading groups; therapeutic values of reading. Twice a week; second semester. *One-half unit.* Assistant Professor Hostetter.

42. Government Publications.—The use as reference material of American state and municipal documents, and of publications of foreign governments. Three times a week; second semester. *Three-fourths unit.* Miss Phelps.

44. Bookbuying for the Large Library.—Twice a week; second semester. *One-half unit.*

45. Library Buildings and Equipment.—Twice a week; first semester. *One-half unit.* (Not given in 1939-1940.)

46. High School Library Administration.—Three times a week; second semester. *One-half unit.* Assistant Professor Hostetter.

48. Library Administration.—Special problems. Three times a week; second semester. *One-half unit.* Dr. McDiarmid.

49. Children's Literature.—Twice a week; second semester. *One-half unit.* Assistant Professor Hostetter.

51. Books and Libraries.—Three times a week; second semester. *One-half unit.* Miss Singleton.

52. Reading Guidance.—Twice a week; second semester. *One-half unit.* Associate Professor Boyd.

MATHEMATICS

Students entering on graduate study with a major in mathematics must have had twenty hours of undergraduate work in mathematics besides the usual freshman courses in algebra, trigonometry, and analytic geometry, including a one-year course in calculus and one year of more advanced work in one or more of the fields of algebra, analysis, and geometry. They should be able to read German or French.

Candidates for a doctor's degree taking a first minor in mathematics are expected to have completed a course in calculus and are required to take two one-year courses beyond the calculus; candidates for a doctor's degree taking a second minor are required to complete at least one course throughout a year beyond the calculus.

The more technical courses offered by the department are arranged mainly in cycles of two or of three years, so that a properly qualified student will usually have opportunity to take any particular course at some time during the three years of residence required for the doctor's degree.

Courses for Graduates

100. Seminar.—For thesis work, or for special reading with the consent of the instructor. Three times a week; both semesters. *One to two units.* Professors Coble, Carmichael, Crathorne, Brahana, Trjitzinsky; Associate Professors Hazlett, Baer; Assistant Professors Levy, Doob, Bourgin. For the master's degree: Assistant Professors Bailey, Ketchum; Dr. Steimley, Dr. Pepper, Dr. Miles.

101. Functions of Real Variables.—Three times a week; both semesters. *One unit.* (Not given in 1939-1940.)

102. Functions of a Complex Variable.—Three times a week; both semesters. *One unit.* Assistant Professor Ketchum.

104. Topology.—Three times a week; second semester. *One unit.* Dr. Vaughan.

109. Seminar in Research Topics.—Time to be arranged; both semesters. *One unit.* Professor Carmichael.

110. Elliptic Functions.—Three times a week; both semesters. *One unit.* (Not given in 1939-1940.) Professor Carmichael.

111. Differential Equations.—Three times a week; both semesters. *One unit.* Professor Trjitzinsky.

112. Linear Difference Equations.—Three times a week; both semesters. *One unit.* (Not given in 1939-1940.) Professor Carmichael.

115. Advanced Topics in the Theory of Functions.—Modern aspects of the theory of functions of a real and of a complex variable. Three times a week; both semesters. *One unit.* (Not given in 1939-1940.) Professor Trjitzinsky.

116. Topics in Classical Analysis.—The theory of the Reimann integral in n dimensions, transformations of variables, convergence, orthogonal functions with applications to integral equations, differential operators, etc. Three times a week; second semester. *One unit.* (Not given in 1939-1940.) Assistant Professor Doob.

124. Theory of Numbers.—Three times a week; both semesters. *One unit.* (Not given in 1939-1940.)

126. Theory of Groups.—Three times a week; both semesters. *One unit.* Professor Brahana.

129. Theory of Statistics.—Three times a week; both semesters. *One unit.* Professor Crathorne.

131. Algebraic Geometry.—Three times a week; both semesters. *One unit.* (Not given first semester of 1939-1940.) Professor Coble.

135. Projective Differential Geometry.—Three times a week; second semester. *One unit.* (Not given in 1939-1940.) Dr. Mendel.

151. Linear Operations.—Three times a week; both semesters. *One unit.* (Not given in 1939-1940.) Assistant Professor Bourgin.

169. The Elements of Higher Geometry and Algebra.—Three times a week; both semesters. *One unit.* Dr. Chanler.

170. Algebra.—Three times a week; both semesters. *One unit.* Associate Professor Baer.

171. Analysis.—Three times a week; both semesters. *One unit.* Assistant Professor Doob.

172. Geometry.—Three times a week; both semesters. *One unit.* Assistant Professor Levy.

Courses for Graduates and Advanced Undergraduates

16-17. Differential Equations and Advanced Calculus.—Three times a week; both semesters. Dr. Steimley, Dr. Peters, Dr. Bristow.

21. Theory of Probability.—Three times a week; second semester. Dr. Welker.

22. Statistics.—May be counted only toward a minor in mathematics. Three times a week; first semester. Dr. Welker.

30–31. Actuarial Theory.—Three times a week; both semesters. Dr. Bower.

32. History of Mathematics.—Three times a week; second semester. (Not given in 1939-1940.) Dr. Moore.

35. Teachers Course.—May be counted only toward a minor in mathematics. Three times a week; both semesters. Assistant Professor Bailey.

36. Advanced Aspects of Euclidean Geometry.—Three times a week; second semester. Dr. Moore.

40. Fundamental Concepts of Mathematics.—Three times a week; both semesters. Dr. Pepper.

70. Introduction to Higher Algebra.—Three times a week; both semesters. Associate Professor Hazlett.

71. Introduction to Higher Analysis.—Three times a week; both semesters. Assistant Professor Bourgin.

72. Introduction to Higher Geometry.—Three times a week; both semesters. (Not given in 1939-1940.)

MECHANICAL ENGINEERING

The prerequisite for graduate work in mechanical engineering is the equivalent of the undergraduate course required for the degree of Bachelor of Science in mechanical engineering in the branches of the subject in which registration is desired. Courses offered to junior and senior students are open for minor credit to students whose major is in other departments.

Courses for Graduates

107. Thermodynamics.—The mathematics of thermodynamics; application of thermodynamics to the solution of physical and engineering problems. Twice a week; both semesters. *One unit.* (Not given in 1939-1940.)

108. The Flow of Fluids and Heat Transfer.—The application of dimensional analysis and other rational formulas. Special problems. Twice a week; both semesters. *One unit.* Professor Macintire.

109. Mechanical Engineering Design.—(a) Machine design; (b) power plant design; (c) dynamics of machinery. Twice a week; both semesters. *One unit.* Professors Leutwiler, Ham.

110. Advanced Heating, Ventilating, and Air Conditioning.—Applications of various systems, notable developments, and results of research. Individual problems. Twice a week; both semesters. *One unit.* Professor Severns.

112. Laboratory Investigations.—Special problems in: (a) combustion; (b) steam; (c) gas and oil engineering; (d) heating, ventilation, and air conditioning; (e) refrigeration; (f) flow of fluids; (g) heat transfer; (h) mechanical transmission of power. Three times a week: both semesters. *One and one-half units.* Professors Polson, Kratz, Ham, Macintire, Severns.

117. Advanced Refrigerating Engineering.—Advanced theory and special cycles. Design of comfort cooling and other special installations. Twice a week; both semesters. *One unit.* Professor Macintire.

MINING AND METALLURGICAL ENGINEERING

MINING ENGINEERING

The prerequisite for major graduate work in mining engineering is the equivalent of the undergraduate courses required for the degree of Bachelor of Science in mining engineering. Courses for advanced undergraduates are open for minor credit to students whose major is in other departments who have the necessary prerequisites including physics, calculus, and mechanics.

Courses for Graduates

101. Advanced Mining Practice.—Twice a week; either semester. *One unit.*

102. Advanced Preparation of Coal and Ores.—Twice a week; either semester. *One unit.*

104.[1] Mining Reports.—Twice a week; either semester. *One unit.*

105.[1] Welfare Work and Education among Mine Employees.—Twice a week; either semester. *One unit.*

Courses for Graduates and Advanced Undergraduates

6. Mechanical Engineering of Mines.—Three times a week; second semester.

8. Mine Administration.—Three times a week; first semester. Assistant Professor Nicholson.

9. Preparation of Coal and Ores.—Three times a week; first semester. Assistant Professor Nicholson.

15. Mine Ventilation.—Twice a week; second semester.

20. Mine Ventilation Laboratory.—Twice a week; second semester.

21. Mine Examination and Valuation.—Three times a week; second semester. Assistant Professor Nicholson.

41. Mining Design.—Three times a week; first semester.

42. Mining Design.—Twice a week; second semester. Assistant Professor Nicholson.

64. Coal and Ore Preparation Laboratory.—Twice a week; second semester. Assistant Professor Nicholson.

[1]Of courses 104 and 105 only one will be given either semester, according to election of students.

METALLURGICAL ENGINEERING

The prerequisite for major graduate work in metallurgical engineering is the equivalent of the undergraduate courses in process and physical metallurgy and in mechanics of materials required for the degree of Bachelor of Science in metallurgical engineering. Courses for advanced undergraduates are open for minor credit to students whose major is in other departments who have adequate preparation in physics and chemistry. Mechanics of materials is prerequisite for Metallurgy 7, 8, and 10.

Courses for Graduates

101. Research in Metallurgy.—Both semesters. *One to two units.* Assistant Professor Wilder.

102. Advanced Physical Metallurgy.—Twice a week; first semester. *One unit.* Assistant Professor Wilder.

103.[1] Advanced Metallography: Ferrous Alloys.—Twice a week; second semester. *One unit.* Assistant Professor Wilder.

104.[1] Advanced Metallography: Non-Ferrous Alloys.—Twice a week; second semester. *One unit.* Assistant Professor Wilder.

Courses for Graduates and Advanced Undergraduates

1. Elements of Metallurgy.—Three times a week; first semester. Assistant Professor Walker.
2. Principles of Metallurgy.—Three times a week; first semester.
4. Physical Metallurgy.—Three times a week; first semester. Assistant Professor Wilder.
5. Ferrous Metallurgy.—Three times a week; second semester. Assistant Professor Wilder.
6. Metallurgical Calculations.—Twice a week; second semester.
7. Ferrous Metallography.—Three times a week; first semester. Assistant Professor Wilder.
8. Ferrous Metallography Laboratory.—Twice a week; first semester. Assistant Professor Wilder.
9. Non-Ferrous Metallurgy.—Three times a week; first semester. Assistant Professor Walker.
10. Non-Ferrous Metallography.—Three times a week; second semester. Assistant Professor Walker.
11. Electrometallurgy.—Three times a week; second semester. Assistant Professor Wilder.
12. Metallography.—Three times a week; second semester. Assistant Professor Wilder.
13. Utilization of Fuels.—Three times a week; first semester.
41. Metallurgical Design.—Three times a week; first semester.
42. Metallurgical Design.—Twice a week; second semester. Assistant Professor Walker.

MUSIC

Students entering on graduate study in music are required to have finished successfully a four-year undergraduate curriculum in music or music education. The major field may be in musicology, theory and composition, music literature,

[1]Of courses 103 and 104 only one will be given, according to election of students.

band and orchestra conducting and administration, (leading to the degree of Master of Music), or music education (leading to the degree of Master of Science in Music Education). A reading knowledge of German and French is highly desirable for the major field of musicology.

Courses for Graduates

100. Contrapuntal Forms of Composition.—Twice a week; both semesters. *One-half unit.* Assistant Professor Kessler.

101. Chromatic and Modern Harmony.—Twice a week; both semesters. *One-half unit.* (Not given in 1939-1940.) Assistant Professor Kessler.

105. Advanced Composition.—Twice a week; both semesters. *One unit.* Associate Professor Miles, Assistant Professor Kessler.

106. Advanced Instrumentation.—Twice a week; both semesters. *One-half unit.* Professor Harding, Assistant Professor Kessler.

110. Instrumental Music of the Eighteenth Century.—Once a week; two hours; first semester. *One unit.* Associate Professor Hill.

111. The Sonata.—Once a week; two hours; second semester. *One unit.* Associate Professor Hill.

112. Beethoven.—Once a week; two hours; both semesters. *One unit.* (Not given in 1939-1940.) Associate Professor Hill.

120. Research in Special Fields.—Time to be arranged; both semesters. *One to two units.* Professors Stiven, Harding; Associate Professor Hill; Assistant Professors Kessler, Kauffman.

130. Administration and Supervision of Music Education.—Twice a week; second semester. *One unit.* Assistant Professor Kauffman.

138. Advanced Conducting and Administration.—Twice a week; both semesters. *One unit.* Professor Harding.

142. Piano Literature.—Twice a week; both semesters. *One unit.* Associate Professor Schoonmaker.

152. Vocal Literature.—Twice a week; both semesters. *One unit.* Assistant Professor Bowen.

162. String Instruments Literature.—Twice a week; both semesters. *One unit.* Assistant Professor Roosa.

182. Organ Literature.—Twice a week; both semesters. *One unit.* Associate Professor Miles.

Courses for Graduates and Advanced Undergraduates

6a–6b. Theory of Music (Free Counterpoint).—Twice a week; both semesters. Associate Professor Miles.

9–10. Analysis and Form.—Twice a week; both semesters. Associate Professor Hill.

11a–11b. Composition in Smaller Forms.—Once a week; both semesters. Associate Professor Miles.

12a–12b. Composition in Larger Forms.—Twice a week; both semesters. Associate Professor Miles.

19a–20a. Double Counterpoint, Canon, and Fugue.—Three times a week; both semesters. Assistant Professor Kessler.

28a-28b. Music Dramas of Richard Wagner.—Twice a week; both semesters. Professor Stiven.

32–33. Advanced History of Music.—Twice a week; both semesters. Associate Professor Hill.

Applied Music (Junior and Senior Grade)

(Only students who can qualify to enter these courses as major students may elect them for graduate credit.)

44a–47b. Piano.—Twice a week; both semesters. Associate Professor Schoonmaker, Assistant Professor Watt, Mr. Fletcher, Mr. Branigan.

54a–57d. Voice.—Twice a week; both semesters. Assistant Professors Hamp, Bowen, Mr. Foote.

64a–67b. Violin.—Twice a week; both semesters. Assistant Professor Roosa.

74a–77b. Violoncello.—Twice a week; both semesters.

84a–87b. Organ.—Twice a week; both semesters. Associate Professor Miles.

PHILOSOPHY

Students who enter on graduate work with philosophy as their major subject must have had a general course in the history of philosophy, a course in logic, and a general course in psychology.

Courses for Graduates

103. Ethics.—Twice a week; second semester. *One unit.* (Not given in 1939-1940.)

105. Seventeenth Century Continental Thought.—Twice a week; first semester. *One unit.* Associate Professor Gotshalk.

108. Plato.—Twice a week; first semester. *One unit.* Professor McClure.

112. German Idealism (Kant).—Twice a week; second semester. *One unit.* Associate Professor Gotshalk.

124. Contemporary Problems.—Twice a week; second semester. *One unit.* (Not given in 1939-1940.)

Courses for Graduates and Advanced Undergraduates

3. History of Ancient and Medieval Philosophy.—Three times a week; first semester.

4. History of Modern Philosophy.—Three times a week; second semester. Associate Professor Gotshalk.

7. Moral Ideas and Practice.—Three times a week; first semester. Professor Murphy.

8. Philosophy of the Recent Past.—Three times a week; first semester. Associate Professor Nicholson.

9. Philosophy of Law and of the State.—Three times a week; second semester.

10. Philosophy of Science.—Three times a week; first semester. Professor Murphy.

11a. Philosophy of Religion (Systematic).—Three times a week; second semester. Associate Professor Nicholson.

11b. Philosophy of Religion (Historical).—Three times a week; second semester. (Not given in 1939-1940.) Associate Professor Nicholson.

12. Philosophy of Art.—Three times a week; first semester. Associate Professor Gotshalk.

14. Advanced Logic.—Three times a week; first semester. Dr. Kubitz.

16. Metaphysics.—Three times a week; second semester. Associate Professor Gotshalk.

21. Theory of Knowledge.—Three times a week; second semester. Dr. Will.

PHYSICAL EDUCATION

Students may take a graduate study minor in the field of physical education. The prerequisite is twenty semester hours of approved undergraduate credit in

the subject. Students who present evidence of satisfactory teaching experience in the field may have this requirement reduced.

The courses listed below are open to both men and women.

Courses for Graduates and Advanced Undergraduates

31. Problems in Physical Education.—Deals particularly with the curriculum. Once a week; first semester. *One unit.* Professor Staley.

32. Problems in School Health.—Deals particularly with health service programs. Once a week; second semester. *One unit.* Professor Stafford.

PHYSICS

A year of calculus and a year of general physics, with laboratory, are prerequisite for all major and minor graduate work in physics. In addition, graduate students whose major is physics must have had one more advanced course in either physics or mathematics and should be able to use references in German.

Courses for Graduates

109. Historical Development of Physics.—One two-hour period a week; second semester. *One unit.* Associate Professor Schulz.

122. Dynamics.—Three times a week; both semesters. *One unit.* Assistant Professor Serber.

123. Dynamical Theory of Sound.—Three times a week; second semester. *One unit.* (Not given in 1939-1940.) Professor Watson.

125. Hydrodynamics.—Especially modern problems in flow and turbulence. *One unit.* (Not given in 1939-1940.)

127. Relativity.—Twice a week; both semesters. *One-half unit.* (Not given in 1939-1940.) Associate Professor Mott-Smith.

128. Problems and Methods in Theoretical Physics.—*One unit.* (Not given in 1939-1940.)

129. Mechanical Vibrations.—The general theory, with applications to plates, rotating shafts, gyroscopes, structures, etc. Twice a week; both semesters. *One-half unit.* (Not given in 1939-1940.)

144. Advanced Electric and Magnetic Measurements.—Both semesters. *One unit.* (Not given in 1939-1940.) Associate Professor Williams.

146. Electrodynamics.—Three times a week; both semesters. *One unit.* Associate Professor Bartlett.

160. Thermodynamics.—*One unit.* (Not given in 1939-1940.)

163. Statistical Mechanics.—Three times a week; second semester. *One unit.* Associate Professor Mott-Smith.

170. Advanced Light.—The electromagnetic theory of light. Both semesters. *One unit.* (Not given in 1939-1940.) Associate Professor Almy.

181a. Quantum Mechanics.—Introductory course. Three times a week; second semester. *One unit.* Assistant Professor Serber.

181b. Quantum Mechanics.—Collison theory and nuclear problems. Three times a week; first semester. *One unit.* Assistant Professor Serber.

182. Conduction of Electricity Through Gases.—Three times a week; first semester. *One unit.* Associate Professor Mott-Smith.

183. Nuclear Physics.—Three times a week; both semesters. *One unit.* Assistant Professor Goldhaber.

184. Line Spectra and Atomic Structure.—Three times a week; first semester. *One unit.* Associate Professor Almy.

185. Band Spectra and Molecular Structure.—Three times a week; second semester. *One unit.* (Not given in 1939-1940.) Associate Professor Almy.

186. Advanced Quantum Mechanics.—Theory of measurements, transformation theory, quantum electrodynamics, theory of elementary particles. Three times a week; both semesters. *One unit.* (Not given in 1939-1940.) Associate Professor Bartlett.

190. Research.—Both semesters. *One to three units.* Professors in the department.

191. Modern Laboratory Practice.—Emphasis on experimental atomic physics: vacuum technique, gaseous discharges, x-rays, thermionics, photoelectricity, electron diffraction, nuclear physics, etc. Both semesters. *One unit.* Assistant Professor Haworth.

198. Seminar.—Both semesters. *One to two units.* Professors in the department.

199. Physics Colloquium.—Attendance is expected of all graduate students. Once a week; both semesters. *No credit.* Associate Professor Mott-Smith.

Courses for Graduates and Advanced Undergraduates

15. Elementary Electricity and Magnetism.—Recommended to students in non-technical courses. Two recitations or lectures and one three-hour laboratory exercise weekly; second semester. Associate Professor Williams.

16. Elementary Heat.—Three times a week; first semester. Associate Professor Paton.

17. Elementary Light.—Two lectures and a three-hour laboratory period weekly; first semester. Associate Professor Schulz.

20a–20b. Theoretical Mechanics.—Three times a week; both semesters. Associate Professor Mott-Smith.

23. Sound.—Three times a week; first semester. Professor Watson.

25. Architectural Acoustics.—Twice a week; second semester. Professor Watson.

30. Introduction to Theoretical Electricity.—For advanced students in physics, chemistry, mathematics, and engineering. Three times a week; first semester. Associate Professor Williams.

40a–40b. Electricity and Magnetism.—Two lectures and a three-hour laboratory period weekly; both semesters. Dr. Jordan.

44. Electric and Magnetic Measurements.—Two three-hour periods a week; both semesters. Associate Professor Williams.

46. Vacuum Tubes.—Applications to physical laboratory problems. One lecture and two three-hour laboratory periods weekly; second semester. Assistant Professor Richardson.

51. Practical Optics.—Two lectures and a three-hour laboratory period weekly; second semester. (Not given in 1939-1940.) Associate Professor Schulz.

60. Heat.—Three times a week; second semester. Associate Professor Paton.

61. Heat Laboratory.—To accompany Physics 60. One three-hour period a week; second semester. Associate Professor Paton.

62. Kinetic Theory of Heat and Radiation.—Three times a week; second semester. Dr. Manley.

71a–71b. Light.—For advanced students in physics, chemistry, mathematics or engineering. Twice a week; both semesters. Associate Professor Almy.

72a–72b. Light Laboratory.—To accompany Physics 71a-71b. Twice a week; both semesters. Associate Professor Almy.

73. Photography.—Two lectures and two three-hour laboratory periods a week; second semester. Dr. Lyman.

80. Atomic Physics.—A lecture and problem course presenting our modern knowledge of the nature and properties of atoms, ions, electrons, protons, positrons, light quanta, photoelectricity, thermoelectric emission, x-rays, radioactivity, and cosmic rays. Three times a week; first semester. Dr. Manley.

81. Radioactivity, Nuclear Physics, and X-rays.—Three times a week; second semester. Professor Kruger.

PHYSIOLOGY

The prerequisites for graduate work in physiology are Physiology 1, 1a, 5, 6, and 7, or equivalents.

Courses for Graduates

101. Journal Club.—Review of literature. Both semesters. *One-fourth unit.* Associate Professor Burge.

102. Research.—Both semesters. *One to two units.* Associate Professor Burge, Assistant Professor Steggerda.

103. Experimental Physiology.—Special phases of the physiology of respiration, circulation, digestion, metabolism, excretion, secretion, glands of internal secretion, nervous system. Both semesters. *One-half to one unit.* Associate Professor Burge, Assistant Professor Steggerda.

Courses for Graduates and Advanced Undergraduates

6. Advanced Mammalian Physiology.—Muscle, nervous system, blood, and circulation. Five times a week; first semester. Assistant Professor Steggerda.

7. Advanced Mammalian Physiology.—Respiration, digestion, excretion, and endocrine glands. Five times a week; second semester. Assistant Professor Steggerda.

POLITICAL SCIENCE

Graduate work in political science is conducted in the following special fields: (1) political theory; (2) international law and relations; (3) American and foreign governments; (4) constitutional law, administrative law, and jurisprudence; (5) public administration.

To be admitted to take political science as a major subject, the student must have had at least 20 hours of undergraduate work in political science, economics, sociology, and history, not less than 12 hours of which have been in political science (which may include three hours in constitutional history). To take political science as a minor he must have had at least nine hours' work in these fields, including six hours in political science.

If a student making political science his major is taking both of his minors in other departments, one of them must be in history, economics, or sociology.

Several courses given in other departments are so closely related to those in political science that graduate students whose major is political science may be permitted on petition to take such courses as part of their major work. Attention is called to the bulletin on *University Training for the Public Service* and to the courses in public law in the College of Law, the courses in public finance in the College of Commerce and Business Administration, the courses in city and regional planning given by the College of Fine and Applied Arts, and the technical courses in municipal and sanitary engineering in the College of Engineering.

Courses for Graduates

101. History of Political Theories.—Three times a week; both semesters. *One unit.* Associate Professor Wilson.

102. The Nature of the State.—Twice a week; second semester. *One unit.* (Not given in 1939-1940.)

103. Seminar in Political Science and Public Law.—Once a week; both semesters. *One-half to two units.* Members of the department.

104. Municipal Administration.—Twice a week; second semester. *One unit.* Professor Kneier.

105. Constitutional Law: Research in Selected Topics.—Twice a week; first semester. *One unit.* Professor Mathews.

106. Special Topics in International Law.—Research course. *One unit.* (Not given in 1939-1940.)

107. Foreign Relations of the United States.—Twice a week; second semester. *One unit.* Professor Mathews.

108. Problems of International Organization.—Special problems in the field of international organization, with particular attention to the League of Nations. *One unit.* (Not given in 1939-1940.) Professor Berdahl.

112. Public Administration.—Special topics in national, state, or local administration in the United States. Twice a week; second semester. *One unit.* Professor Fairlie.

113. State Government: Research in Selected Topics.—First semester. *One unit.* (Not given in 1939-1940.) Professor Mathews.

114. Political Parties.—*One unit.* (Not given in 1939-1940.) Professor Berdahl.

121. Problems in British Government.—Twice a week; first semester. *One unit.* Professor Fairlie.

128. Contemporary Governmental Problems.—*One unit.* (Not given in 1939-1940.)

Courses for Graduates and Advanced Undergraduates

4. Municipal Government.—Three times a week; first semester. Professor Kneier, Dr. Snider.

5. American Constitutional System.—Three times a week; first semester. Professor Mathews.

6a. International Law.—Three times a week; first semester. Dr. Jobst.

6b. International Law.—(Continuation of 6a.) Three times a week; second semester. Dr. Jobst.

7. American Foreign Relations.—Twice a week; second semester. Professor Mathews.

8. International Organization.—Twice a week; first semester. Professor Berdahl.

9. Principles of Jurisprudence.—Three times a week; second semester. Professor Fairlie.

11. The Constitution and Industrial Legislation.—Three times a week; second semester. Dr. Hagan.

12a. Public Administration.—Three times a week; first semester. Professor Fairlie.

12b. Problems in Public Administration.—Twice a week; second semester. Professor Fairlie.

13. Government and the Economic Order.—Three times a week; first semester. Assistant Professor Hagan.

14a. Political Parties: Party History and Issues.—Three times a week; second semester. (Not given in 1939-1940; alternates with Political Science 14b.) Professor Berdahl.

14b. Political Parties: Organization and Methods.—Three times a week; first semester. Professor Berdahl.

18. Legislation in the United States.—Three times a week; second semester. (Not given in 1939-1940.)

21. British Government.—Twice a week; first semester. Professor Fairlie.

22. Continental European Governments.—The constitutions and political systems of the principal countries of continental Europe. Three times a week; second semester.

28. Current Governmental Problems.—Twice a week; second semester. (Not given in 1939-1940.)

31. Contemporary Political Theory.—Three times a week; second semester. Associate Professor Wilson.

32. Principles of Political Science.—Three times a week; second semester. Associate Professor Wilson.

34. Municipal Problems.—Municipal administration in the United States and Europe. Three times a week; second semester. Professor Kneier, Dr. Snider.

PSYCHOLOGY

Graduate students who elect psychology as their major subject must have had standard courses, of university grade, both in general psychology and in the psychological laboratory. One general university course is the minimal requirement for graduate students who apply to the department for a minor subject.

Training in clinical psychology is provided by courses offered at the Institute for Juvenile Research in Chicago. The prerequisite to these courses is recommendation by the Department of Psychology and one year of graduate work with a major in psychology, or, in case of especially qualified students who have majored in psychology as undergraduates, one semester of graduate work. The minimum period of attendance at the Institute necessary for the Master of Arts degree is six months; and for the Doctor of Philosophy degree, one academic year. Recommended minors are education and sociology.

Courses for Graduates

103. Research.—Experimental investigations. Both semesters. *One-half to two units.* Professor Woodrow; Associate Professor Higginson; Assistant Professors Anderson, Feder, Pennington.

105. Seminar.—Discussion of current topics in their historical setting, with especial emphasis upon research problems. Both semesters. *One unit.* Professor Woodrow.

106. Neural Theory of the Psychological Functions.—Second semester. *One unit.*

108. Quantitative Methods.—The logic of research methods in psychology. Second semester. *One unit.*

109. Problems of Motivation.—Discussion of current research and concepts within the field of motivation. Second semester. *One unit.* Professor Young.

115. Advanced Child Psychology.—Critical evaluation of research methods and findings; practice in selected techniques of child study including experimental and clinical approaches. First semester. *One unit.* Assistant Professor Anderson.

144. Theory and Practice of Student Personnel Work.—The psychological principles and techniques of student personnel work, with special reference to methods of making provision for individual differences at the college level. Supervised observation and practice in the Personnel Bureau. Second semester. *One unit.* Assistant Professor Feder.

The following courses (counted as courses in psychology when taken by candidates for advanced degrees in psychology) are offered at the Institute for Juvenile Research in Chicago by the Department of Criminology, Social Hygiene, and Medical Jurisprudence of the College of Medicine.

101. Research in Juvenile Behavior.—*One to three units.* Professor Schroeder.

102. Advanced Work in Juvenile Behavior.—*One to three units.* Professor Schroeder.

103. Special Abilities and Disabilities.—*One or two units.* Associate Professor Brown.

104. Psychological Tests.—*One or two units.* Associate Professor Brown.

105. Psychology of Behavior Problems.—*One or two units.* Associate Professor Brown.

Courses for Graduates and Advanced Undergraduates

5. Comparative Psychology.—A systematic survey of animal behavior with particular reference to the behavior of the vertebrates. Laboratory and discussion. Three times a week; first semester. Dr. McAllister.

8. Feeling and Emotion.—Facts, problems, and methods of affective psychology with special reference to recent physiological studies. Two times a week; first semester. (Not given in 1939-1940.) Professor Young.

9. Physiological Psychology.—The physiological basis of conscious experience. Twice a week; first semester.

11. Learning and Comprehension. — Processes and functions in acquiring knowledge and skill. Twice a week; first semester.

13. Minor Problems (Advanced Laboratory).—Application of methods suitable to new problems in general and comparative psychology. Three times a week; second semester. Associate Professor Higginson, Dr. McAllister.

16. Genetic Psychology.—The psychological development of the individual with special reference to childhood. Twice a week; second semester. Assistant Professor Anderson.

17. History of Psychology.—Twice a week; first semester. (Not given in 1939-1940.) Professor Young.

18. Perception.—Perceptual experience; recent revisions of perceptual theory including the doctrine of the *Gestalt.* Lectures and discussions. Twice a week; second semester.

20. Systematic Psychology.—A critical study of contemporary systems: behaviorism, *Gestalt psychologie,* structural, functional and dynamic psychology. For seniors and graduates. Twice a week; second semester. Professor Woodrow.

23. Abnormal Psychology. — Analytical consideration of types of behavior deviating from the normal. Three times a week; both semesters. Assistant Professor Pennington, Dr. McQuitty.

26. Psychology of Thinking.—A consideration of facts and theories based on experimental studies. Three times a week; second semester. Dr. McAllister.

28. Psychology of Motivation.—Drive, purpose, attitude, desire, sentiment, social incentives as determinants of behavior; conflict and adjustment. Twice a week; second semester. Professor Young.

34. Individual Differences.—A study of the variation in the mental characteristics of individuals and of groups. Three times a week; first semester. Professor Woodrow.

43. Student Personnel Work.—The application of psychological principles and techniques in fitting education processes to the needs, interests, and abilities of the individual college student. Three times a week; first semester. Assistant Professor Feder.

RAILWAY ENGINEERING

The prerequisite for graduate work in railway engineering is the equivalent of the undergraduate courses required for the degree of Bachelor of Science in engineering in the branch of the subject in which registration is desired.

Undergraduate courses 5 and 8 (Railway Laboratory) may be taken for major credit (½ unit each) toward the master's degree in railway engineering. Certain other undergraduate courses may be taken for minor credit.

Courses for Graduates

102. Locomotive Design.—Economic and legal considerations; specifications; weight distribution; relation of steam pressure, compounding, and superheat to performance and economy. Once a week; first and second semesters; *two units.* Or once a week; either semester; *one unit.* Professor Young.

106. Locomotive Operation.—Train resistance and locomotive tractive force; locomotive tonnage ratings. Once a week; first and second semesters; *two units.* Or once a week; either semester; *one unit.* Professor Schmidt.

110. Railway Location.—Effect of location on earning capacity; problems in original location, relocation, and reduction of grades of existing lines. Once a week; first and second semesters; *two units.* Or once a week; either semester; *one unit.* Professor King.

SOCIOLOGY

Preparation for major work in sociology must include at least the equivalent of twenty-three semester hours in the social and biological sciences, of which at least eight must be in sociology. The remaining fifteen hours may be distributed among economics, philosophy, history, psychology, political science, and biology (heredity). Preparation for graduate work in sociology as a minor requires at least six hours of credit in sociology.

Courses for Graduates

100. General Sociology.—Twice a week; first semester. *One-half to one unit.* Professor Hiller.

102. Recent Developments in Sociology.—Twice a week; second semester. *One unit.* Associate Professor Albig.

106. Urban Communities and Urbanization.—Twice a week; second semester. *One unit.* Assistant Professor Tylor.

107. Rural Communities.—Twice a week; second semester. *One unit.* (Not given in 1939-1940.) Assistant Professor Tylor.

108. Research in the Social Effects of Poverty, Their Prevention and Treatment.—Twice a week; first semester. *One unit.* Associate Professor Timmons.

109. Research in Criminology.—Twice a week; second semester. *One unit.* Professor Taft.

110. Population Problems.—Twice a week; second semester. *One unit.* Professor Hiller.

121. Folk Sociology.—Twice a week; second semester. *One unit.* (Not given in 1939-1940.)

122. Regional Problems and Planning.—Twice a week; second semester. *One unit.* (Not given in 1939-1940.)

124. Advanced Penology.—Twice a week; first semester. *One unit.* Professor Taft.

128. Fusion of Culture Resulting from Immigration.—Twice a week; second semester. *One unit.* (Not given in 1939-1940.) Professor Hiller.

129. Modern Human Migrations.—Twice a week; first semester. *One unit.* (Not given in 1939-1940.) Professor Taft.

150. Seminar and Research.—The field, type, and amount of work are to be adjusted to the needs of the student in the respective graduate years. *One-half to three units.* Members of the department.

Courses for Graduates and Advanced Undergraduates

3. Social Evolution.—Three times a week; both semesters. Mr. Ahrens.

5. The Family.—Three times a week; both semesters. Associate Professor Timmons.

6. Urban Sociology.—Three times a week; both semesters. Assistant Professor Tylor.

7. Rural Sociology.—Three times a week; second semester. Associate Professor Lindstrom.

8. Charities.—Three times a week; first semester. Associate Professor Timmons.

9. Criminology.—Three times a week; both semesters. Professor Taft.

10. Population Problems and Human Ecology.—Three times a week; first semester.

11. Sociology of the Region.—Three times a week; first semester. Assistant Professor Tylor.

14. Public Opinion.—Three times a week; both semesters. Associate Professor Albig.

17. Methods of Sociological Research.—Three times a week; first semester. Professor Hiller.

18. Recent Developments in Public Welfare Administration.—Three times a week; second semester. Associate Professor Timmons.

20. Social Progress and Social Values.—Three times a week; second semester. (Not given in 1939-1940.)

24. Penology.—Three times a week; second semester. Professor Taft.

27. Community Welfare Organization.—Three times a week; second semester. Associate Professor Timmons.

28. Immigration, Assimilation, and Culture Diffusion.—Three times a week; second semester. Professor Hiller.

29. Modern Human Migrations.—Three times a week; first semester. (Not given in 1939-1940.) Professor Taft.

30. Races of Mankind.—Three times a week; first semester. (Not given in 1939-1940.)

40. Ethnology of the American Indians.—Three times a week; first semester. (Not given in 1939-1940.)

42. Primitive Societies.—Three times a week; first semester. Associate Professor Albig.

44. The Negro.—Three times a week; second semester. (Not given in 1939-1940.)

45. Prehistoric Archeology.—Three times a week; first semester. (Not given in 1939-1940.)

SPANISH AND ITALIAN

A student entering on graduate work for an advanced degree must have had at least three years of college work in his major subject, including one advanced literary course. Students who enter with a knowledge of Latin and a second Romance language, together with a reading knowledge of German, will find their work for an advanced degree greatly facilitated.

SPANISH

Courses for Graduates

130. Spanish Literature in the Sixteenth Century.—Twice a week; both semesters. *One unit.* (Not given in 1939-1940.) Professor Van Horne.

131. Spanish Literature in the Seventeenth Century.—Twice a week; both semesters. *One unit.* I, Associate Professor Hamilton. II, Professor Van Horne.

134. Spanish Literature in the Eighteenth Century.—Twice a week; both semesters. *One unit.* (Not given in 1939-1940.) Associate Professor Hamilton.

135. La Novela Española Moderna.—(In Spanish.) Twice a week; both semesters. *One unit.* (Not given in 1939-1940.) Associate Professor Hamilton.

138. Spanish-American Literature.—Twice a week; both semesters. *One unit.* Professor Van Horne.

139. Spanish Literature in the Middle Ages.—Twice a week; both semesters. *One unit.* Associate Professor Hamilton.

185. Old Spanish Readings.—Twice a week; both semesters. *One unit.* (Not given in 1939-1940.) Associate Professor Hamilton.

195. Seminar.—Research work in special topics. Both semesters. *One to two units.* Professor Van Horne, Associate Professor Hamilton.

Courses for Graduates and Advanced Undergraduates

10a–10b. General Survey of Spanish Literature.—Three times a week; both semesters. Associate Professor Hamilton.

11a-11b. Cervantes: Don Quixote.—Twice a week; both semesters. Dr. Elsdon.

17a-17b. Modern Spanish Drama.—Twice a week; both semesters. Associate Professor Hamilton.

ITALIAN

Courses for Graduates

140. Italian Literature in the Middle Ages. Petrarch, Boccaccio.—Twice a week; both semesters. *One unit.* (Not given in 1939-1940.) Professor Van Horne.

143. Italian Literature in the Renaissance.—Twice a week; first semester. *One unit.* (Not given in 1939-1940.) Professor Van Horne.

146. Modern Italian Literature.—Twice a week; both semesters. *One unit.* Professor Van Horne.

195. Seminar.—Research work in special topics. Both semesters. *One to two units.* Professor Van Horne.

Courses for Graduates and Advanced Undergraduates

3a-3b. Dante: The Divine Comedy.—Twice a week; both semesters. Miss Pietrangeli.

THEORETICAL AND APPLIED MECHANICS

The prerequisite for the courses for graduates in theoretical and applied mechanics is the equivalent of the undergraduate courses in theoretical and applied mechanics required for the degree of Bachelor of Science in engineering.

Courses offered to senior students are open for minor credit to students whose major is in other departments.

Courses for Graduates

101. The Development of Basic Ideas in Mechanics.—Twice a week; both semesters. *One unit.* Professor Moore.

103. Hydraulics.—Twice a week; both semesters. *One unit.* Assistant Professor Kittredge.

107. Laboratory Investigations in Strength of Materials.—Twice a week; both semesters. *One-half to two units.* Professor Moore, Assistant Professor Dolan.

108. Laboratory Investigations in Hydraulics.—Twice a week; both semesters. *One to two units.* Assistant Professor Kittredge.

109. Laboratory Investigations in Plain and Reinforced Concrete.—Twice a week; both semesters. *One to two units.* Professor Richart.

110. Analytical Study of Experimental Work on Reinforced Concrete.—Beams, frames, and footings. Twice a week; first semester. *One unit.* Professor Richart.

111. Analytical Study of Experimental Work on Reinforced Concrete.—Columns and slabs. Twice a week; second semester. *One unit.* Professor Richart.

112. Structural Mechanics.—Three times a week; first semester. *One unit.* Assistant Professor Schwalbe.

113. Selected Topics in Structural Mechanics.—Twice a week; second semester. *One-half unit.* Assistant Professor Schwalbe.

114. Theory of Elasticity with Applications to Engineering Problems.—Three times a week; first semester. *One unit.* Assistant Professor Newmark.

115. Theory of Elasticity with Applications to Engineering Problems.—(Continuation of 114). Twice a week; second semester. *One unit.* Assistant Professor Newmark.

116. Resistance of Materials.—Three times a week; first semester. *One-half to one unit.* Professor Seely.

117. Properties of Engineering Materials.—Three times a week; second semester. *One-half to one unit.* Professor Seely.

198. Thesis.—Both semesters. *One unit.* Members of the department.

Courses for Graduates and Advanced Undergraduates

41. Advanced Mechanics of Materials.—Three times a week; first semester. Professor Seely, Mr. Smith.

42. Engineering Materials.—Three times a week; second semester. Professor Seely, Assistant Professor Collins.

43. Laboratory Work in Hydraulics.—Twice a week; both semesters. Assistant Professor Lansford.

44. Laboratory Work in Testing Materials.—Twice a week; both semesters. Professor Putnam.

47. Engineering Analysis.—Three times a week; first semester. Assistant Professor Jensen.

48. Engineering Analysis.—(Continuation of 47). Three times a week; second semester. Assistant Professor Jensen.

49. Advanced Dynamics and Vibrations.—Three times a week; first semester. Assistant Professor Dolan.

50. Advanced Dynamics and Vibrations.—(Continuation of 49). Three times a week; second semester. Assistant Professor Dolan.

ZOOLOGY

At least sixteen semester hours of college work in zoology are required for entering on major graduate study in this subject. Under special circumstances advanced work in closely allied subjects may be accepted in lieu of the fourth semester's work in zoology. When zoology is chosen for a minor the courses listed for graduates and undergraduates must be preceded by at least one full year's undergraduate work in zoology.

For the prosecution of graduate study in zoology a reading knowledge of German and French is indispensable and familiarity with Latin and Greek is of great advantage.

No special degree in wildlife management is offered in this department, but as preparation for work of this type, students are advised to select courses from the following list: Zoology 11, 17, 18, 19a-b, 31, 109, 110, 111, 125, and research courses, with a minor in botany, physiology, entomology, or bacteriology.

Graduate students specializing in zoology are strongly advised to spend at least one summer in study at the seashore. Every candidate for the doctor's degree will be required to furnish evidence of having completed satisfactorily at least one six-week period in such work at an approved location.

Courses for Graduates

102. Evolution of Vertebrates.—Twice a week; first semester. *One unit.* (Given in 1939-1940 and in alternate years.) Professor Adams.

103. Cytology.—Twice a week; both semesters. *One unit.* (Given in alternate years; not given in 1939-1940.) Professor Shumway.

106. General Embryology.—Twice a week; both semesters. *One unit.* (Given in 1939-1940 and in alternate years.) Professor Shumway.

109. Physiological Ecology.—Twice a week; second semester. *One-half to one unit.* (Given in alternate years; not given in 1939-1940.) Professor Shelford, Assistant Professor Kendeigh.

110. Climatic Ecology.—Twice a week; second semester. *One-half to one unit.* (Given in 1939-1940 and in alternate years.) Professor Shelford.

111. Experimental and Field Ecology.—Once a week; both semesters. *One-half to two units.* Professor Shelford.

115. Factors of Individual and Racial Development.—Twice a week; both semesters. *One unit.*

117. Invertebrate Taxonomy.—Twice a week; second semester. *One-half to one unit.* (Not given in 1939-1940.) Professor Van Cleave.

118. Advanced Protozoology.—Twice a week; second semester. *One unit.* Associate Professor Kudo.

131. Helminthology.—Twice a week; first semester. *One-half to one unit.* Professor Van Cleave, Assistant Professor Thomas.

Individual Research Courses

121. Invertebrate Zoology and Parasitology.—*One to two units.* Professor Van Cleave and Assistant Professor Thomas.

122. Vertebrate Morphology.—*One to two units.* Professor Adams.

124. Experimental Zoology and Genetics.—*One to two units.* Professor Zeleny, Assistant Professor Hall, Dr. Luce.

125. Ecology and Wildlife Management.—*One to two units.* Professor Shelford, Assistant Professor Kendeigh.

126. Vertebrate Embryology and Cytology.—*One to two units.* Professor Shumway, Associate Professor Adamstone.

128. Protozoology.—*One to two units.* Associate Professor Kudo.

129. Physiological Zoology.—*One to two units.* Assistant Professor Prosser.

Courses for Graduates and Advanced Undergraduates

11. Animal Ecology and Geography.—Three or four times a week; first semester. Professor Shelford.

17. Field Zoology.—Two or three times a week; first semester. Professor Van Cleave.

18. Protozoology.—Twice a week; first semester. Associate Professor Kudo.

19a. Vertebrate Ecology and Wildlife Management.—Twice a week; first semester. Assistant Professor Kendeigh, Professor Shelford.

19b. Vertebrate Ecology.—Twice a week; second semester. Assistant Professor Kendeigh.

20a–20b. Current Investigations.—Must be taken by all graduate students whose major is in zoology. Once a week; both semesters. Members of the department.

21a–21b. Introduction to Zoological Research.—Two to five times a week; both semesters. Members of the department.

22–23. Comparative Anatomy of Vertebrates.—Two to four times a week; both semesters. (Not given in 1939-1940.)

25. Experimental Genetics.—Three times a week; second semester. Dr. Luce.

31. Helminthology.—Twice a week; second semester. Assistant Professor Thomas.

41. Physiological Zoology.—Three times a week; first semester. Assistant Professor Prosser.

42. General Physiology.—Three times a week; second semester. Assistant Professor Prosser.

63. Comparative Vertebrate Embryology.—Two to five times a week; first semester. (Not given in 1939-1940.) Professor Shumway.

66. Vertebrate Organogeny.—Two to five times a week; second semester. (Not given in 1939-1940.) Professor Shumway.

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UNIVERSITY OF ILLINOIS

The Graduate School

Announcement for 1940-1941

Departments at Urbana

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URBANA

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THE GRADUATE SCHOOL
EXECUTIVE FACULTY

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Harley Jones Van Cleave, Ph.D., Professor of Zoology

Wilbur M. Wilson, M.M.E., C.E., Research Professor of Structural Engineering

GRADUATE SCHOOL CALENDAR

Graduate students will find it to their advantage to observe the dates in this calendar

Summer Session

1940

June 17, Monday.....Registration day.
June 18, Tuesday.....Instruction begins.
July 5, Friday.....Latest date for registering for French and German examinations.
July 12, Friday.....Examination in French.
July 19, Friday.....Examination in German.
Aug. 3, Saturday, 12 M.....Latest date for candidates for degrees in August to deposit theses.
Aug. 9, 10, Friday, Saturday.....Summer Session examinations.

First Semester

Sept. 13, 14, Friday, Saturday.....Registration days.
Sept. 14, Saturday.....Latest date for registration of former students without penalty.
Sept. 14, Saturday.....Latest date for registering for French and German examinations.
Sept. 14, Saturday.....Latest date for candidates for Ph.D. degree in October to deposit theses.
Sept. 16, Monday.....Latest date for candidates for masters' degrees in October to file applications for degrees and to deposit theses.
Sept. 18, Wednesday, 8 A.M.....Instruction begins.
Sept. 27, Friday.....Examination in French.
Sept. 28, Saturday.....Latest date for Ph.D. finals for degree in October.
Oct. 4, Friday.....Examination in German.
Oct. 5, Saturday, 12 M.....Latest date for changing study-lists without fee.
Oct. 15, Tuesday.....Latest date for preliminary examinations (for full residence).
Nov. 1, Friday.....Latest date for candidates for professional engineering degrees to file statements of professional study and experience.
Nov. 20, Wednesday, 12 M.....Thanksgiving recess begins.
Nov. 25, Monday, 1 P.M.....Thanksgiving recess ends.
Dec. 21, Saturday, 12 M.....Holiday recess begins.
Dec. 31, Tuesday.....Latest date for candidates for professional engineering degrees to submit outlines of theses.

1941

Jan. 6, Monday, 8 A.M.....Holiday recess ends.
Jan. 11, Saturday, 12 M.....Latest date for registering for French and German examinations.
Jan. 13, Monday.....Latest date for filing applications for masters' degrees to be conferred in February.
Jan. 13, Monday.....Latest date for candidates for Ph.D. degrees in February to deposit theses.
Jan. 20, Monday–Jan. 28, Tuesday...Semester examinations.
Jan. 24, Friday.....Examination in French.
Jan. 27, Monday.....Latest date for candidates for masters' degrees in February to deposit theses.
Jan. 31, Friday.....Examination in German.

Second Semester

1941

Jan. 31, Feb. 1, Friday, Saturday....Registration days.
Feb. 1, Saturday.....Latest date for Ph.D. finals for degree in February.
Feb. 1, Saturday.....Latest date for registration of former students without penalty.
Feb. 5, Wednesday, 8 A.M.....Instruction begins.
Feb. 15, Saturday.....Latest regular date for applications for scholarships and fellowships for 1941-1942.
Feb. 22, Saturday, 12 M.....Latest date for changing study-lists without fee.
Feb. 28, Friday.....Latest date for preliminary examinations (for full residence).
April 1, Tuesday.....Latest date for filing applications for masters' degrees to be conferred in June.
April 11, Friday, 8 A.M.....Easter recess begins.
April 12, Saturday.....Latest date for registering for French and German examinations.
April 15, Tuesday, 8 A.M.....Easter recess ends.
April 25, Friday.....Examination in French.
May 1, Thursday.....Latest date for candidates for professional engineering degrees to deposit theses.
May 2, Friday.....Examination in German.
May 12, Monday.....Latest date for candidates for Ph.D. degree in June to deposit theses.
May 15, Thursday.....Latest date for filing applications for masters' degrees to be conferred in August.
May 15, Thursday.....Pre-registration for masters' degrees to be conferred in August.
May 23, Friday–June 2, Monday.....Semester examinations.
May 26, Monday.....Latest date for candidates for masters' degrees in June to deposit theses.
May 26, Monday.....Latest date for Ph.D. finals.
June 9, Monday.....Seventieth Annual Commencement.

Summer Session

June 16, Monday.....Registration day.
June 17, Tuesday, 8 A.M.....Instruction begins.
July 5, Saturday.....Latest date for registering for French and German examinations.
July 11, Friday.....Examination in French.
July 18, Friday.....Examination in German.
August 2, Saturday, 12 M.....Latest date for candidates for degrees in August to deposit theses.
August 8, 9, Friday, Saturday.....Summer Session examinations.

Notes

Examination in one foreign language must be passed before residence on second year may be counted (pp. 13, 17).

Two copies of thesis are required of candidates for masters' and doctors' degrees (pp. 13, 18).

Candidates for masters' degrees announce thesis subjects at beginning of second half-year of work, or after completion of four units, or at beginning of third summer session (p. 13).

Candidates for Ph.D. degree announce thesis subjects within six weeks after beginning of third year of residence (p. 18).

Candidates for Ph.D. degree deposit theses two weeks before date of final examination (p. 18).

HEADS AND CHAIRMEN OF DEPARTMENTS GIVING GRADUATE WORK

Accountancy	Hiram Thompson Scovill
Agricultural Economics	Harold Clayton M. Case
Agronomy	William Leonidas Burlison
Animal Husbandry	William Ernest Carroll
*Architecture (and Architectural Engineering)	Loring Harvey Provine
*Astronomy	Robert Horace Baker
Bacteriology	Fred Wilbur Tanner
Botany	John Theodore Buchholz
*Business Organization and Operation	Hiram Thompson Scovill
Ceramic Engineering	Cullen Warner Parmelee
Chemistry	Roger Adams
Civil Engineering	Whitney Clark Huntington
Classics	William Abbott Oldfather
Dairy Husbandry	Harrison August Ruehe
Economics	Merlin Harold Hunter
Education	Thomas Eliot Benner
Electrical Engineering	Ellery Burton Paine
English	Harold Newcomb Hillebrand
Entomology	Clell Lee Metcalf
French	Joseph Francis Jackson
Geology and *Geography	Frank Walbridge DeWolf
German	Albert William Aron
History	William Spence Robertson
*Home Economics	J. Lita Bane
Horticulture	
*Library Science	Carl Milton White
Mathematics	Arthur Byron Coble
Mechanical Engineering	Oscar Adolph Leutwiler
Mining and Metallurgical Engineering	Harold Leroy Walker
*Music	Frederic Benjamin Stiven
Philosophy	Arthur Edward Murphy
*Physical Education	Seward Charle Staley
Physics	Francis Wheeler Loomis
*Physiology	Frederic Russell Steggerda (Secretary)
Political Science	John Archibald Fairlie
Psychology	Herbert Woodrow
Sociology	John William Albig
Spanish and Italian	John Van Horne
Theoretical and Applied Mechanics	Fred B. Seely
Zoology	Victor Ernest Shelford

*Give work for masters' degrees only.

THE GRADUATE SCHOOL

History and Organization

The University of Illinois offered facilities for advanced study and research in various lines as early as 1872. Organized graduate instruction, however, under the name of the Graduate School, was first undertaken in 1892. In 1894 the administration of the school was vested in the Council of Administration, and the Vice-President of the University became Dean of the School. In 1906 the Graduate School was organized as a separate faculty.

By action of the Trustees the teaching faculty of the Graduate School includes all members of the University Faculty who give instruction in approved graduate courses. The affairs of the School, however, are in charge of the Executive Faculty.

Admission

Admission to the Graduate School may be granted to graduates of institutions whose requirements for the bachelor's degree are substantially equivalent to those of the University of Illinois and to applicants from other institutions approved by the Executive Faculty, as hereinafter provided. *Admission to the Graduate School does not, however, imply admission to candidacy for an advanced degree, and gives no right or claim to be so admitted. A mere accumulation of "credits" or "grades" is not sufficient.*

A graduate of an independent conservatory or school of music will be considered for admission to graduate work in music under the following conditions: (1) The degree must be based on a four-year curriculum in music. (2) The undergraduate work presented for the degree must include not less than 18 hours (30 hours for Music Education curriculum) in academic subjects, with not less than the equivalent of two years of college work in foreign languages, one year of which must be in French or German completed in college. (3) The applicant must pass a qualifying examination in the branch of music which he wishes to pursue as his major field in graduate study, given under the supervision of the Director of the School of Music.

Admission to graduate courses may be granted only to those who have had the requisite undergraduate work in those courses or departments; students whose preparation is considered inadequate may be required to take without credit certain undergraduate courses. But a student of mature age who satisfies the Dean and the department concerned of his ability to pursue graduate work in a given line may be enrolled in particular graduate courses, without reference to a degree, and permitted to carry on such study or investigation under the direction of a department of the University as the department shall recommend and the Dean approve.

Application blanks for admission may be secured from the Registrar of the University. Every applicant must submit with his application for admission an official transcript of his college record. All students, except those entering only for summer sessions, who have not previously taken a physical examination at the University, must take such an examination. The examination is given by

the University Health Service without cost to the student, if taken at the time of appointment during the registration period.

Character of Graduate Work

The principal aims of graduate study are the development of the power of independent work and the promotion of the spirit of research. Each candidate for a degree is expected to have a wide knowledge of his subject and of related fields of work. The graduate student is not expected to get from lecture and laboratory courses all the knowledge and training necessary to meet the requirements for his degree.

Registration and Program of Study

The following regulations concerning registration and program of studies are laid out primarily for first-year students. Registration for second- and third-year students is described on page 16.

Registration.—Each graduate student must register at the beginning of each semester. The registration of a new student may be accepted at any time provided the student is prepared to take up courses actually under way. Credit towards the fulfillment of the residence requirement dates, however, from the time of registration and not from the beginning of the semester or year in which the student enters.

A new student must fill out in duplicate an application for admission and submit it to the Registrar, from whom, after the approval of his application, he will receive a card of admission and a study-list which will give details of procedure in registering. He should fill out the study-list after consultation with his adviser, or the person in charge of his major work, and also with the instructors whose courses he wishes to elect. *Registration, including the payment of fees, must be completed by the close of the registration days of the Graduate School. Otherwise a fee of $5.00 for late registration will be charged all former students of the University of Illinois.*

Changes in Study-lists.—A graduate student is expected to plan his work so carefully that changes in his study-list during the semester will not be necessary. When a change seems advisable, however, it may be permitted without fee if made within three weeks of the date of registration. After that date a fee of one dollar is charged for each change, except that the total charge for rearrangement authorized on any one change slip shall not exceed two dollars.

Advanced Undergraduate Courses Open to Graduate Students.—The amount of graduate credit appropriate to these courses ranges from one-fourth to one unit. In the more elementary courses it should not exceed one-half unit. The actual amount in each case should be specified on the student's program by the department concerned, and is subject to approval by the Dean. Courses which are regularly open to sophomores may not be taken for graduate credit.

Seniors and Graduate Study.—If at the beginning of the second semester of his senior year a student who has been in residence at least one year is within five hours of a bachelor's degree, he may be permitted to register for courses which may count for residence for a master's degree, provided his program is limited to approximately twelve formal class, lecture, or laboratory exercises

a week, and is approved by the Dean at the time of registration. Only students of excellent record will be allowed this privilege.

Miscellaneous and Listeners' Courses.—A graduate student in full standing and carrying a minimum program, may be permitted, under proper circumstances, to elect one miscellaneous subject (that is, a course which does not count towards an advanced degree). No subject is open as a miscellaneous course unless it has a specific educational bearing on the student's major or minor subjects of study. A student who elects a miscellaneous course is required to register in it, do the work, and pass the semester examinations, unless he is permitted to withdraw under the rules.

Graduate students are permitted to attend classes as listeners, providing a card bearing the approval of the adviser and instructor is filed at the Graduate School office. A student who attends as a listener is not permitted to participate in the class work or the examination.

No student may register for a full minimum program of work for graduate credit if it is necessary for him to carry at the same time more than one miscellaneous subject.

Students on the Staff.—Assistants and others on the University staff who undertake to do graduate work are permitted to take an amount of work determined by the terms of their employment. Such a student, if required by his engagements to teach more than five classes a week or to have laboratory work or supervision exceeding ten hours a week, will find it impossible to complete the work for the master's degree in one year, or the doctor's degree in three years.

Residence and Work Done Elsewhere.—Continuous residence and study are required of all members of the Graduate School, unless they are granted leave of absence by the Dean, upon recommendation of the professor in charge of their work, for the purpose of carrying on elsewhere studies or investigation in the line of work for their degrees.

Graduate Study in the Summer.—Graduate students in the summer session are subject to the same scholastic requirements as those in the regular University year. Their study-lists must be approved by the Dean of the Graduate School, or his representative. Two to two and one-half units of graduate work may be taken in the summer session. Two units is considered a full minimum program for the summer. Attendance during four out of six consecutive summer sessions, or one semester and two summer sessions, is considered the equivalent of one year in residence. No course offered in the summer session may be taken for credit towards a higher degree unless it is described in the summer session circular as accepted for that purpose.

The Executive Faculty may, at the request of a given department, accord recognition to its summer session work subject to the following conditions: (1) Study in the University of Illinois summer session may be counted in partial fulfillment of the residence requirements for the degree of Doctor of Philosophy, but at least one continuous academic year of residence at the University at some time during the second or third years of the doctoral program is required. (2) Persons electing to use this plan shall be required to submit a schedule of study covering the second and third years of work toward the doctorate. This schedule of study must be approved by the adviser in charge

of the major subject and by the Dean of the Graduate School. (3) Apart from the provisions stated above, the present practices and standards of the Graduate School relating to the doctorate shall be continued.

Graduate Work in Medical and Dental Sciences.—Graduate courses in medical and dental sciences are offered in the Colleges of Medicine and Dentistry of the University of Illinois, and summer courses are offered in the College of Medicine. Circulars describing the courses offered and conditions of admission and work may be obtained from the Committee on Graduate Work in the College of Medicine, 1853 West Polk Street, Chicago.

Failures.—A graduate student who fails in any course in his major subject cannot secure his degree in the same year in which the failure occurred. No condition examinations are given graduate students.

Withdrawal.—If after registration a graduate student wishes to withdraw from any course or to add other work, he must first secure the necessary papers from the Dean's office. See the regulations concerning changes in study-lists, page 10. If he wishes to withdraw from the University he must get clearance papers at the Dean's office.

Masters' Degrees[1]

Character of Masters' Degrees.—The master's degree conferred depends upon the character of the bachelor's degree. The usual practice is that A.M. shall follow A.B., and that M.S. shall follow B.S. However, this practice may be departed from in cases where the undergraduate course of study of the candidate was of a kind for which some reputable institutions in this country give A.B., while others give B.S. In Music the M.Mus. shall follow the B.Mus., and the M.S. in Music Education shall follow the B.S. in Music Education.

Amount of Work Required.—Candidates for the degree of Master of Arts or Master of Science are required to do at least one full year's work in residence, usually including a thesis. Four to five units constitute a normal semester program for the master's degree. A minimum of eight units must be completed for the degree. Only first-rate students are permitted to secure a degree with this minimum program. In some departments special examinations are required of candidates for masters' degrees. In all cases the student must satisfy the duly approved conditions set by his major and minor departments.

Unless otherwise permitted, every student must take each semester at least one course open to graduate students only (courses numbered 100 and upwards).

In the first year of his graduate study each student is required to attend a minimum of four formal class, lecture, or laboratory exercises a week. Schedules involving an unusually large number of formal class meetings per week will require the special approval of the Dean.

Work Done Elsewhere.—Members of the staff and high school teachers residing and employed in Urbana or Champaign who have done graduate work in approved institutions elsewhere may secure credit not to exceed four units towards the master's degree by passing examinations in that work. They may complete the work for the degree by securing at least four units more while registered in the Graduate School for not less than one academic year.

[1]For special rules governing the degree of Master of Arts in the Social Sciences, see page 80.

Graduate students who have been in residence one semester or its equivalent may offer for credit not more than nine weeks of work at a marine or fresh-water biological laboratory or in biological or geological field work, on condition that the work be of graduate grade under a qualified instructor or director as certified by the student's major adviser and approved by the Dean of the Graduate School; that approval be obtained by the student in advance; and that a written report of the work accomplished be presented by the student and approved as satisfactory by the student's major adviser.

Majors and Minors.—A candidate for a master's degree may do all his work in one subject, or he may select a major and one minor, or a major and two minors. A major or minor denotes the field of knowledge of a department, or such part thereof as constitutes a separate and independent division of that field. For a master's degree a major is at least half the work, or a minimum of four units, for one year. Less than one unit may not be counted as satisfying the requirements of a minor without the approval of the department concerned.

Foreign Language.—The ability to use one or more of the modern languages ordinarily studied in the undergraduate curriculum is desirable for all candidates for the master's degree, and in some lines of study is required. No student will be permitted to acquire residence toward the second year for the doctorate until he has passed the preliminary examination in at least one of these languages.

Masters' Theses.—Each candidate for a master's degree is required to present two copies of a thesis on some subject approved by the professor in charge of his major work. Such approval, except in case of students working for masters' degrees in summer sessions only, must be secured and the subject of the thesis filed at the office of the Graduate School not later than the beginning of the second half-year of residence. Students working for masters' degrees exclusively in summer sessions must announce their thesis subjects not later than the beginning of their third session in residence. The requirement of a thesis may be waived, however, on the recommendation of the professor in charge of his major work and the approval of the Dean, *provided application to waive the thesis is made at the time for announcing thesis subjects.* A student excused from writing a thesis must replace it with courses of instruction.

No one will be excused from writing a thesis unless one-half of his program of studies consists of courses numbered 100 and upwards.

The thesis required from a candidate for a master's degree will ordinarily demand from one to two units of work, and may not exceed three units except by special permission. The thesis must be typewritten, on "thesis paper,"[1] and the title page must be printed. The carbon copy may be on plain paper of approximately the same weight as the thesis paper. Both copies of the thesis in its final form, together with a certificate of approval by the proper officer, must be left at the Dean's office at least two weeks before the date on which the degree is to be conferred. No article prepared for another use, or previously published, will be accepted as a thesis.

Permission for the publication of the material of a master's thesis should be obtained from the Dean of the Graduate School before such publication is carried out.

[1]No other will be accepted by the Dean. "Instructions for the Preparation of Theses" may be obtained at the Dean's office.

Applications for Degrees.—Each candidate for the degree of Master of Arts or Master of Science or Master of Music shall file an application for the degree on a blank provided for the purpose, to be had at the Dean's office. For the dates of applications and of deposition of theses, consult the calendar at the beginning of the bulletin.

Degrees in August.—Students who expect to become candidates for the master's degree in August may be recommended at the June meeting of the Senate subject to the successful completion of the work for which they are to register in the summer session. However, in order to avail themselves of this privilege, students must file with the Dean before the June meeting of the Senate an exact statement of the work necessary to complete the requirements for the degree. Blanks for this purpose may be secured at the Dean's office. For the dates of filing application and pre-registration blanks, consult the calendar at the beginning of the bulletin.

Thesis Work on Leave of Absence.—Under proper conditions a student may be permitted to complete the last fourth of his work, if devoted to his thesis, under leave of absence for a period not to exceed the equivalent of two semesters. To get such permission the student must have secured credit for at least six units; must petition for the privilege; must submit to the Dean an outline of the proposed investigation, approved by the professor in charge of his major work, and must submit satisfactory evidence that adequate facilities are available to him at the place where he intends to do the proposed work. Approval on all these points must be obtained one collegiate year before the thesis is due. Immediately following approval the student must register and pay an incidental fee of $20.00.

Grades.—Students' work is graded in five classes, A, B, C, D, and E. The last indicates a failure. D indicates unsatisfactory, though passable, work.

A student who receives two units of a grade below B during his first year of graduate work may not complete the first year of residence by carrying the minimum program of eight units for the master's degree. Three units of a grade below B disqualify a student as a candidate for a degree.

A failure or absence from examination in any course or failure in any other examination prescribed by the department of the major may prevent the conferring of the degree; and, as already indicated, failure in any course in the major field precludes the conferring of the degree in the same year.

Master of Business Administration

(See page 33 for description.)

Master of Music and Master of Science in Music Education

(See page 71 for description.)

Master of Social Administration

(See page 79 for description.)

Second Degrees in Engineering

Two classes of second degrees are open to graduates of the College of Engineering, namely, academic and professional.

The *academic* second degree in engineering is Master of Science, following Bachelor of Science, in civil engineering, electrical engineering, etc. This degree is conferred in accordance with the regulations described above for *academic work in residence only.*

The *professional* second degrees in engineering are as follows:

Master of Architecture, after B.S. in architecture.

Architectural Engineer, after B.S. in architectural engineering.

Ceramic Engineer, after B.S. in ceramic engineering.

Chemical Engineer, after B.S. in chemical engineering.

Civil Engineer, after B.S. in civil engineering or in railway civil engineering.

Electrical Engineer, after B.S. in electrical engineering or in railway electrical engineering.

Mechanical Engineer, after B.S. in mechanical engineering or in railway mechanical engineering.

Engineer of Mines, after B.S. in mining engineering.

Engineer-Physicist, after B.S. in engineering physics.

Professional degrees in engineering may be conferred on two classes of candidates: (1) those who have received an academic degree in engineering from the University of Illinois; (2) those who have received an academic degree in engineering[1] from other institutions of equal standing and who have been members of the teaching or research staff of the College of Engineering or Engineering Experiment Station or the Department of Chemistry of the University of Illinois for at least three years prior to the conferring of the professional degree.

A candidate declares his candidacy by filing with the Dean of the College of Engineering, as chairman of the committee in charge, a detailed statement covering his professional engineering experience. This statement must be made upon a standard form supplied by the Dean of the College of Engineering, as chairman of the committee in charge, and must be filed not later than the first Monday in November preceding the commencement at which the candidate expects to receive the degree. No statement of experience will be considered by the committee which does not show that the candidate has had a minimum of four years of acceptable engineering experience after receiving the degree of Bachelor of Science, and that for at least three years he has been in responsible charge of engineering work. Responsible charge in engineering teaching may be considered as responsible charge of work. In determining the acceptability of the engineering experience of the candidate the committee will be guided by the character of his professional work and the degree of responsibility involved, and will take into consideration such evidences of professional ability and growth as may be shown by his investigation of engineering problems, his contributions to technical literature, and his membership and activity in engineering societies.

If the professional experience of the candidate is accepted he must submit for approval, prior to December 31, an outline of his proposed thesis. The completed thesis, in the form prescribed in the "Instructions for the Preparation of Masters' and Doctors' Theses," must be deposited with the Dean of the College of Engineering not later than May 1. The candidate must present himself at commencement in order to receive the degree.

[1]Including chemical engineering.

A candidate for a professional engineering degree must pay the incidental fee of twenty-five dollars on being notified that his professional experience is accepted as qualifying him to enter as a candidate for the degree. No one will be enrolled as a candidate for the degree at the following commencement who does not pay his fee at this time. When a candidate for a professional engineering degree has once been accepted and paid his fee, he is eligible to receive the degree at any time within five years, without additional fee, on completion of the requirements; provided, however, that unless he completes the requirements within two years his name will be dropped from the list of candidates and in order to receive the degree within the five-year period he must register once more.

The Degree of Doctor of Philosophy

Major and Minor Subjects.—A member of the Graduate School who desires to become a candidate for the degree of Doctor of Philosophy is required to pursue a major subject in the department in which his research lies. He is also required to choose one minor subject, or he may choose two. If one minor only is chosen it must be taken in a department of study other than that of the major, and credit for it may be earned by work representing not less than four units, or one-sixth of the total residence required for the doctorate. If two minors are chosen, one must be a subject closely related to the major. With the approval of the adviser and the Dean it may be a division of the major field of study. The other minor (not less than two units) must, in that case, be taken in a department of study other than that of the major.

Except by special permission of the Dean the preliminary examination in major and minor subjects may not be taken until the minor work has been done.

Method of Computing Residence.—Credit for a full year of graduate work means that the student has during that time devoted all his working time and energy to study of a graduate grade. Second- and third-year students shall hereafter register in terms of units. For each course with fixed credit or with variable credit within fixed limits, the registration shall be for such credit as is determined in the usual way for such course. For thesis courses the amount of credit may be widely variable and may be fixed in each case in accordance with the judgment of the department and the needs of the student, subject to approval of the Dean of the Graduate School and the following provision regarding total credits: The registration for a full-time student shall be for not less than four nor more than five units; for a part-time student the registration shall ordinarily be on the basis of such fraction of four units as corresponds to the time given to study. It should be clearly understood, however, that, for second-year students, a mere accumulation of unit credits will not in itself entitle a student to the privilege of taking preliminary examinations, and that, for third-year students, such an accumulation of credits will not in itself entitle the student to admission to the final examination.

Period of Study.—The normal *minimum* period of study required for securing the degree of Doctor of Philosophy is three years, during which the student is required to devote all his working time to his studies. All three years must be spent in resident graduate study at some accredited educational institution and either the first two or the last one of the three must be spent at the University

of Illinois. The degree is conferred, however, not for residence during a certain period, but for scholarly attainments and power of investigation, as proved by a thesis and examinations. For study in summer sessions, see page 11.

Work Done in Other Universities.—Credit for graduate work done in other universities is not "transferred." However, it may be accepted on examination as equivalent to resident work at the University of Illinois, provided the institution in which it was done is of high standing.

Preliminary Examinations.—

A. In Languages.—The student will be required to demonstrate his ability to read French and German and other languages needed in his work. (In special cases the Executive Faculty, upon recommendation of the student's adviser, may substitute for either one of the languages usually required some other language which can be shown to be more useful in that student's professional research.) No student will be permitted to acquire residence towards the second year of graduate study until he has passed the examination in at least one of these languages. Both the examination in French and that in German must be passed before the student is admitted to the preliminary examination in his major and minor subjects. For the dates of these language examinations consult the calendar at the beginning of this bulletin. See calendar for date when application for admission to these examinations must be made.

B. In Major and Minors.—Towards the end of his second year of study, or by special permission, at the beginning of his third year (not later than about October 15), a student who wishes to become a candidate for the degree must submit to a preliminary examination conducted by a committee appointed by the Dean. This examination is intended to test the student's knowledge of the fields of his major and minor subjects of study and to determine whether he is prepared for the final year of work for the doctorate. It is partly oral, and may be wholly so.

The student will not be admitted to his preliminary examination until the faculty is satisfied that he has finished substantially the equivalent of two years' graduate work. He must do a full year's graduate work between his preliminary examination and the completion of his work for the doctorate.

Final Examination.—At least two weeks before the time when the degree is conferred, the candidate must submit to a final examination, given by a committee appointed by the Dean. This examination is primarily on the research work of the student, as embodied in his thesis, but it is not confined to that. It extends to the whole field of study of the candidate. It will not be confined to the courses which the candidate has attended in the University of Illinois only, if he has done part of the work elsewhere; nor even to the field covered by the courses specifically taken in this or other universities; but will be so conducted as to determine whether the candidate has a satisfactory grasp of his major subject as a whole, and a general acquaintance with the fields of knowledge represented by his course of study.

The final examination may not be divided. The examination must be taken all at one time even though it requires several sessions.

If after having passed his preliminary examination, he fails in the third year of his study to meet the expectations of the professors in charge of his work,

or in any way fails to maintain the standard of scholarship and power of research expected of him, he may be refused admission to the final examination.

Other Examinations.—Before the candidate is admitted to the final examination and the defense of his thesis, he may be required to take any other examination, oral or written, that is thought proper by the various departments in which he has studied.

The above examinations are in addition to those in the courses for which the student is registered. These must be taken at the time for which they are set in the examination schedule.

Thesis.—The power of independent research must be shown by the production of a thesis on some topic connected with the major subject of study. The candidate is expected to defend his thesis or dissertation before the members of the faculty, or as many of them as may wish to question him about it, in connection with his final examination.

The subject of the thesis should be chosen not later than the end of the second year of residence and must be submitted for formal approval by the faculty not later than six weeks from the beginning of his third year of residence.

Two typewritten copies of the complete thesis, *the original on thesis paper,*[1] and the first carbon on plain paper of approximately the same weight, and in final form, must be deposited in the office of the Dean for presentation to the examining committee not later than two weeks prior to the final examination and not less than four weeks before the time when the degree is conferred. At the same time, the candidate must deposit with the Dean a manuscript of the essential part, or an abstract, or a digest of his thesis, in condition for publication at a cost not to exceed seventy-five dollars ($75). The manuscript must be sufficient to show the method followed, the evidence used, and the conclusions reached in the investigation, and must bear the approval of the department and the Executive Faculty of the Graduate School.

The candidate must pay to the Comptroller before graduation the sum of seventy-five dollars ($75) out of which the University will print at least one hundred copies of this manuscript for circulation by the University, unless the thesis entire or in abbreviated form is published by the author or is accepted for publication by a standard journal or publisher within a year from the date of graduation. In the latter event, and after one hundred copies have been presented to the University by the writer, the cash deposit shall be returned to him.

The typewritten and printed forms of the thesis must comply with the regulations given in "Instructions for the Preparation of Masters' and Doctors' Theses," copies of which may be obtained at the Dean's office.

Degree of Doctor of Philosophy in Engineering

The degree of Doctor of Philosophy in Engineering is offered in certain lines of academic work of a high scholastic type in engineering science for students who wish to prepare themselves as teachers, investigators, and experts.

The general requirements for this degree, as to preliminary education, linguistic attainments, etc., are the same as in other subjects.

[1]No other will be accepted by the Dean.

The following lines of engineering science, or others approved by the Graduate School, may be elected as majors:

Engineering mechanics
Steam engineering
Hydraulic and sanitary engineering
Electrical engineering
Heating and ventilation engineering
Railway engineering
Masonry construction and structural engineering
Coal-mining engineering
Ceramic engineering
Chemical engineering

The first minor may be any of the above or one of the following sciences or an authorized combination of two of them:

Theoretical mechanics
Mathematics
Thermodynamics
Bacteriology
Chemistry
Geology
Physics (experimental or mathematical)
Zoology
Botany
Economics

The second minor should be in other than engineering subjects.

Agricultural and Engineering Experiment Stations

Attention is called to the unusual opportunities for graduate study in connection with the Agricultural and Engineering Experiment Stations. By undertaking a line of graduate study in close association with some one of the projects carried on in those Stations, the student will come into contact with aspects of his specialty which he would rarely touch in a purely academic study, and he will thus broaden his outlook. The Experiment Stations make available apparatus, equipment, and the services of mechanicians, which may materially facilitate the carrying on of investigations.

Scholarships and Fellowships

A number of scholarships and fellowships have been established by the Trustees of the University open to candidates who are not over thirty years of age at the time when the appointment is to be made. To first-year graduate students of ability and promise there are open a number of scholarships with stipends of $300 and carrying exemption from the payment of tuition, incidental, and laboratory fees. There are two classes of fellowships—University Fellowships and Honorary Fellowships. The first are open to second-year and third-year graduate students with stipends of $500 and $600, respectively. To be eligible for a $600 fellowship an applicant must have passed both language examinations before the date for filing applications and must be prepared to take the preliminary examination in his major and minor subjects by

the following June. Honorary Fellowships carry no stipends and no exemption from the payment of fees. Their purpose is to give recognition to superior students who are not in need of financial assistance.

Candidates for these scholarships and fellowships must be graduates of the University of Illinois, or of colleges or universities having equivalent requirements for bachelors' degrees.

Application must be made on blanks to be obtained from the Dean of the Graduate School. These application forms should be sent to the Dean of the Graduate School as early as possible in February of the academic year preceding that for which the fellowship is desired. No application will be considered if received later than February fifteenth, until after April fifteenth, the date when appointees from the first list of applications must accept or refuse their appointments.

Persons appointed are notified on April first and must send the Secretary of the Board of Trustees notice of their acceptance or refusal by April fifteenth; and must agree that, if accepted, the appointment will not be resigned to take a similar one in any other institution during the year for which it is awarded, and that they will not engage in any outside employment for remuneration.

Nominations to fellowships are made on the grounds of worthiness of character, scholastic attainments, and promise of success in the principal line of study or research to which the candidate proposes to devote himself.

Research Graduate Assistantships in the Engineering Experiment Station

The Engineering Experiment Station is devoted to the study of problems of special importance to engineering and to manufacturing, railway, mining, and industrial interests, and the stimulation and elevation of engineering education. Approximately fourteen research graduate assistantships with a nominal stipend have been established, open to graduates of approved technical schools and universities. Applicants to whom these graduate assistantships are awarded agree to hold them for two years, devoting one-half their time to the work of the Engineering Experiment Station. At the end of this period, if all requirements have been met, the degree of Master of Science will be conferred. Several additional assistantships are usually maintained by industrial organizations. Applications for graduate assistantships should be made to the Director of the Engineering Experiment Station not later than March 1.

Libraries

The general University library, including the departmental libraries and reading rooms listed below, is located at the University in Urbana. The libraries of the College of Pharmacy and the College of Medicine are in Chicago.

These libraries contain about 1,209,000 volumes and about 350,000 pamphlets. Of these, 1,149,000 books and 341,000 pamphlets are in the libraries at Urbana; the rest are in Chicago. The library at Urbana also contains about 3,900 maps and 11,300 pieces of sheet music. Over 8,000 periodicals are currently received, including over 200 newspapers published in Illinois and about 125 foreign language newspapers published in the United States.

The general library of the University is open daily, from 8 a.m. until 10 p.m. and on Sunday from 2:30 p.m. until 5:30 p.m.

In the book stacks are 216 cubicles for the use of faculty members and graduate students.

A number of departmental and college libraries and reading rooms are maintained in the library and in other buildings on the campus; these libraries do not necessarily contain all the books in the respective subjects. In some instances they are primarily for the use of the graduate students and advanced undergraduate students in the departments using the respective buildings. The principal departmental libraries and reading rooms are the following:

Name of Library	*Location*	*Volumes*
Philosophy, Psychology, and Education	Library Building	9,500
Classics	Library Building	30,000
Modern Languages	Library Building	8,700
English	Library Building	6,800
Seventeenth Century Book Room	Library Building	10,600
History and Political Science	Library Building	14,000
Economics, Sociology, and Commerce	Library Building	6,500
Natural History	Natural History Building	58,900
Law	Law Building	63,100
Architecture, Ricker Library of	Architecture Building	15,100
Agriculture	New Agriculture Building	27,100
Chemistry	Noyes Chemistry Laboratory	16,400
Physics	Physics Building	1,600
Mathematics	Mathematics Building	13,200
Engineering	Engineering Hall	42,200
Landscape Architecture	New Agriculture Building	7,000

The library includes most of the bibliographical aids published for the book-trade in this and other countries; a Union Card Catalog numbering over 2,800,000 cards, chiefly of books in seven other large American libraries; many printed catalogs of important libraries, e.g., Catalogue of Printed Books in the British Museum, Gesamtkatalog der Preussischen Bibliotheken, and Catalogue Général des livres imprimés de la Bibliothèque Nationale; and many bibliographies of special subjects.

The following brief statements indicate the resources of the library for research in a few subjects selected at random:

Official publications of municipalities number about 32,500 reports, charters, and ordinances, issued by over 3,000 American and 300 foreign municipalities, and more or less complete files of about 50 municipal periodicals. Systematic attempts are made to secure current publications, especially of Illinois municipalities.

Mathematics numbers 13,200 volumes, about 9,500 dissertations and other pamphlets, and includes files of over 300 periodicals and other serials.

Chemistry includes about 11,500 volumes of bound periodicals, 4,900 other books, 1,500 pamphlets, 7,200 theses, and receives currently 255 journals, most of which are complete sets.

Italian history includes the Cavagna Library, 40,000 volumes, pamphlets, and maps, and 138 bundles of manuscripts with typed partial index to families and places dealt with; much material of Italian local history, biography, and genealogy.

Classical literature, history, and archaeology embraces approximately 30,000 volumes including complete sets of about 150 journals and serials; the library

of Professor Wilhelm Dittenberger, of Halle, 5,600 items acquired in 1907; the library of Professor Johannes Vahlen, of Berlin, 10,000 items acquired in 1913; and a collection of about 17,000 dissertations, reprints, etc.

The Ricker Library of Architecture numbers 13,100 volumes, 15,600 lantern slides, and 9,000 photographs and drawings. It is not only a good working library for faculty and students in architecture, but contains many of the older and rarer works.

The Seventeenth Century Book Room houses about 10,600 volumes, including the Milton collection of approximately 1,500 volumes, and other titles relating to the literary, political, and religious life of seventeenth century England, especially the Milton period.

The newspaper collection contains 16,700 bound volumes of general newspapers. Included in it are files of 220 newspapers published in Illinois, generally complete since 1912, and 135 foreign language newspaper published in this country, generally complete since 1916. In the latter group are newspapers in 30 different languages.

Music embraces over 18,000 scores and pieces of music, over 4,200 books on music, definitive complete works of most major composers, many complete files of foreign and domestic journals.

Fees and Expenses

Except as noted below, graduate students pay fees as follows:

Matriculation fee	$10.00
Incidental fee, each semester, for residents of Illinois	35.00
All students, not residents of Illinois, pay each semester an incidental fee of	62.50
Incidental fee for students registered for thesis work towards the master's degree on leave of absence	20.00
Graduation fee	10.00
For late registration	5.00
For change in study-list	1.00

Persons on University appointment at a salary of $1,600 per year or less, eligible for admission to University work, or on scholarship or fellowship appointment in the Graduate School are exempt from the payment of incidental and laboratory fees in courses counting for graduate credit. Course fees indicated in paragraphs (a) or (b) or (c) below and laboratory fees are required for courses not counting for graduate credit.

On approval of the dean of the college concerned, persons may register for reduced schedules. Such persons pay the matriculation fee and the usual laboratory fees. Under the following provisions they pay the course fees indicated in lieu of the regular incidental fee:

(a) For undergraduate and professional work in the colleges and schools at Urbana: $2.50 per credit hour, provided registration is for not more than eight semester hours.

(b) For undergraduate work in the College of Pharmacy: $5.00 per credit hour for residents of Illinois, or $7.50 per credit hour for non-residents of Illinois, provided registration is for less than ten semester hours.

(c) For undergraduate work in the Colleges of Medicine and Dentistry: First-year and second-year courses, 25 cents per clock hour, plus regular laboratory fees in the courses for which the student registers; third-year and fourth-year courses, 20 cents per clock hour plus full laboratory fees and an additional 15 cents per clock hour for courses involving dispensary or infirmary fees. Non-Illinois students registered for partial programs pay one and one-half times the above stated clock hour fees, except for dispensary and infirmary.

(d) For graduate work at Urbana or Chicago: At the rate of $10.00 per unit, provided registration is for not more than two units.

All persons shall pay the matriculation and graduation fees.

Table board may be obtained at prices ranging from $5 to $7 a week.

Room rent, single room, ranges from $15 to $25 a month; double room, from $10 to $15 a month, each person.

Special Fees in Music.—In addition to the general fees listed above, graduate students registering in courses in applied music (voice, piano, violin, violincello, organ, or band instruments) pay special fees as follows:

Students enrolled for graduate study in music pay each semester	$25.00
Students registered for graduate study in other subjects pay for each two hours of credit each semester	25.00
Practice Fees.—For one hour a day, for one semester (additional hours at the same rate):	
Upright piano	3.00
Grand piano	4.50
Small practice organ	10.00
Large practice organ	15.00
Organ in Recital Hall (one hour per week)	5.00

DEPARTMENTS OF INSTRUCTION

Courses open to graduate students are of two classes. The first class is wholly of graduate grade, and the courses are numbered 100 upwards. The second class includes the courses classified as for graduates and advanced undergraduates. These carry numbers below 100. The courses numbered 100 and upwards are all accepted for major credit. Those of the other group are in many cases accepted for minor credit only. This is especially true of courses which are open to juniors.

All courses have certain prerequisites for admission. Inasmuch as the prerequisite preparation may be gained at other institutions from courses differing from those offering a similar preparation at the University of Illinois, so that a statement of prerequisites as given here would not be understood elsewhere, their description is omitted altogether. However, a student who wishes to enter a particular course must satisfy the department concerned that he has had in some form the prerequisites for admission to the course.

For the convenience of first-year students the credit value of graduate courses is given in units. These values have no significance for second-year and third-year students.

The credit received for "courses for graduates and advanced undergraduates" is in accordance with the regulations of the Graduate School (see page 10).

Students are admitted to graduate standing in agriculture who have had a thorough training in the sciences underlying agriculture, and who are otherwise eligible to the Graduate School, even though their undergraduate course of study lacked to some extent the amount and kind of technical work in agriculture included in the course of study for the bachelor's degree in agriculture at the University of Illinois.

AGRICULTURAL ECONOMICS

Graduate students may take work in agricultural economics leading to the Master of Science and Doctor of Philosophy degrees. In the general field of agricultural economics, work is offered in farm organization and management, land economics, agricultural marketing, and agricultural prices and statistics.

Graduate work in agricultural economics as a major subject is open to students: (1) who have at least twenty hours of undergraduate work in economics, agricultural economics, business organization and operation, accountancy, history, political science, or sociology, of which at least twelve hours must have been in economics and agricultural economics, or (2) who have had a thorough training in the principles of agricultural economics, including at least twelve hours in economics and agricultural economics, either in connection with or in addition to a course of study substantially equivalent to that required for the Bachelor of Science degree in agriculture in this University.

Graduate students taking major work in agricultural economics for the Master of Science degree are required to take at least two units of economics,

including one unit of economic theory, and for the Doctor of Philosophy degree to take a minimum of five units in economics, including economic theory and history of economic thought.

The required work in economics may be treated as a part of the work in the major field with the approval of the Department of Agricultural Economics and the Dean of the Graduate School. Otherwise, the work in the Department of Economics will be considered a first minor, in which case the program in that minor will require the approval of the Department of Economics.

To take agricultural economics as a minor, the student must have had at least twenty hours of undergraduate work in agricultural and economic subjects.

Courses for Graduates

103. Personnel Relationships in Teaching, Research, and Extension Work.—See Animal Husbandry 103 and Agronomy 119. *One-half unit.* (Not given in 1940-1941.)

109. Seminar. Thesis Course.—All graduate students whose major is agricultural economics must register in this course, but only those writing theses acceptable for the degree of Master of Science will be given credit. Once a week; both semesters. *One to two units.* Members of the department.

110. Theory of Agricultural Economics.—Twice a week; both semesters. *One unit.* Professor Stewart.

111. Agricultural Prices and Statistics.—Twice a week; continuous through both semesters. *One unit.* Associate Professor Working.

112. Agricultural Economics Research.—Credit is conditional upon the completion of an acceptable report of investigation. Once a week; both semesters. *One to two units.* Members of the department.

120. Farm Management Principles and Investigational Methods.—Twice a week; second semester. *One unit.* Professor Case.

135. Problems in Marketing Agricultural Products.—Twice a week; first semester. *One unit.* Professors Norton and Ashby, Associate Professor Bartlett.

Courses for Graduates and Advanced Undergraduates

10. Economic Relationships of Agriculture.—Three times a week; first semester. Professor Stewart.

11. Agricultural Prices and Statistics.—Three times a week; second semester. Associate Professor Working.

14. Cooperation in Agriculture.—Three times a week; second semester. Associate Professor Bartlett.

15. Financing Agriculture.—Three times a week; both semesters. Professor Norton.

17. Economic History of Agriculture.—Twice a week; first semester. (Not given in 1940-1941.)

18. Land Economics.—Three times a week; second semester. Professor Stewart.

22. Types and Systems of Farming.—Field trip required; estimated expense, $3. Three times a week; first semester. Associate Professor Wilcox.

25. Advanced Farm Management.—Field trip required; estimated expense, $5. Three times a week; both semesters. Associate Professor Johnston.

26. Farm Administration.—Field trip required; estimated expense, $3. Three times a week; first semester. Mr. Hannah.

31. Grain Grading and Marketing.—Three times a week; first semester. Professor Norton, Assistant Professor Sherwood.

34. Marketing Dairy Products.—Inspection trip required; estimated expense, $5. Twice a week; second semester. Associate Professor Bartlett.

36. Marketing Horticultural Products.—For seniors and graduates specializing in horticulture. Inspection trip required, estimated expense, $10. Three times a week; first semester. (Not given in 1940-1941.)

37. Marketing Livestock.—Twice a week; second semester. Professor Ashby.

42. Farm Appraisals.—Local field trips to be arranged; estimated expense, $5. Four times a week; second semester. Members of departments involved.

AGRONOMY

Graduate students may take work in agronomy leading to the Master of Science and Doctor of Philosophy degrees. They may specialize for either degree in soil fertility, soil physics, soil biology, plant breeding, or crop production.

For either degree, if two minors are chosen, the first should be, and both may be, taken in a department other than agronomy. If only one minor is chosen, it must be in a field outside of the department.

A candidate for the master's degree in agronomy must present an acceptable thesis, and show proficiency in his work as demonstrated by suitable examinations, prescribed by the department.

Fifteen semester hours in agronomy and related subjects are prerequisites for a minor, and five additional hours for a major. Students must have had the fundamental work in science prerequisite to the major and minor fields of study. Those with unusually good training in science may be permitted by the department to waive certain of the above mentioned requirements.

Courses for Graduates

101. Chemical Properties of Soils; Their Relation to Soil Development and Plant Growth.—Twice a week; second semester. *One unit.* Professor DeTurk.

104. Seminar.—Once a week; both semesters. *One-fourth unit.* The Graduate Staff.

112. Theory and Analysis of Plant Breeding Problems.—Three times a week; second semester. *One unit.* Professor Woodworth.

114. Principles Underlying the Production of Crops.—Twice a week; second semester. *One unit.* Professors Burlison and Dungan.

118. Research.—A special problem is chosen by each student. Graduate students writing theses should so indicate in registering in Agronomy 118. Both semesters. *One-half to four units.*
(a) Soils.—Professors Bauer, DeTurk, R. S. Smith, and Sears.
(b) Crops.—Professors Burlison, Woodworth, and Dungan, Assistant Professor Bonnett, Dr. Fuelleman.

119. Personnel Relationships in Teaching, Research, and Extension Work.—See Animal Husbandry 103. (Not given in 1940-1941.)

Courses for Graduates and Advanced Undergraduates

7. Crop Production as Affected by Environmental Factors.—Three times a week; first semester. Professors Burlison and Dungan.

8. Forage Crops.—Field trip required; estimated expense, $1. Three times a week; second semester. Dr. Fuelleman.

10. Genesis, Morphology, Classification, and Geography of Soils.—Local field trips to be arranged; estimated expense $3. Three times a week; second semester. Professor R. S. Smith.
11. Role of Microorganisms in Soil Fertility.—Three times a week; first semester. Professor Sears.
13. Soil Productivity, Its Variation, Modification, and Maintenance.—Three times a week; second semester. Professor Bauer.
14. Grain Grading and Marketing.—See Agricultural Economics 31.
22. Improvement of Farm Crops by Breeding.—Three times a week; first semester. Professor Woodworth, Assistant Professor Bonnett.
29. Principles of Field Plot Experimentation.—Three times a week; first semester. (Given in 1940-1941 and in alternate years.) Professor Woodworth.
30. Metabolism of Soil Microorganisms.—Three times a week; second semester. (Given in alternate years; not given in 1940-1941.) Professor Sears.
31. Biological Methods of Soil Investigation.—Three times a week; second semester. (Given in 1940-1941 and in alternate years.) Professor Sears.
32. Physical Methods of Soil Investigation.—Three times a week; first semester. (Given in 1940-1941 and in alternate years.) Assistant Professor Stauffer.
33. Chemistry of Fertilizers and Their Soil Reactions.—Three times a week; first semester. Professor DeTurk.
35. Farm Appraisals.—See Agricultural Economics 42.

ANIMAL HUSBANDRY

The department of animal husbandry offers graduate work leading to the degrees of Master of Science and Doctor of Philosophy in Animal Husbandry, and the degree of Master of Science in Animal Pathology and Hygiene. For a major or minor for the master's degree the student may specialize in the general field of animal production, or in the special fields of animal genetics, animal nutrition, animal pathology, and poultry husbandry. For a major or minor for the doctor's degree he may specialize in animal genetics, the economics of meat production, animal nutrition, and animal pathology. Advanced work in poultry husbandry may be taken for a minor for the doctor's degree.

For registration for a minor in animal husbandry a student must offer at least fifteen college credits in the field, including the principles of feeding, the principles of genetics, livestock production and livestock judging, and he must have had an introductory course in organic chemistry. For a major a student must offer at least five additional college credits in animal husbandry or in courses related to the major field of specialization. Besides these general requirements, a student must have had the special training required for effective graduate study in the field of his chosen major: for work in animal production, the economics of meat production; for work in poultry husbandry, an introductory course in farm management; for work in animal genetics, at least an introductory course in general zoology; for work in animal nutrition, a satisfactory course in quantitative chemical analysis, and preferably also a course in animal physiology; for work in animal pathology, training in histology, physiology, bacteriology, and hygiene. Attention is also directed to the advisability of including in undergraduate preparation for graduate work in any

phase of animal husbandry at least introductory training in French or German and in mathematics.

In the case of students with an unusually thorough training in science who wish to pursue graduate work in some special field of animal husbandry from a non-agricultural viewpoint, the department may waive certain of the above requirements.

Students who desire to become candidates for the doctorate and who register for a minor in the general fields of animal production or the economics of meat production must take Animal Husbandry 7 and 41, if they have not taken these courses or their equivalents during their undergraduate training. Such students registering for a major in these general fields must take in addition Animal Husbandry 131, and will find it desirable to register in Animal Husbandry 35.

Courses for Graduates

103. Personnel Relationships in Teaching, Research, and Extension Work.—Organization and administration of research; objects, methods, and the sources of error in experimental work. Open to graduate students in all departments of the College of Agriculture. Once a week; second semester. *One-half unit.* (Not given in 1940-1941.)

112. Research.—One to three times a week; both semesters. *One-half to two units.* Investigations along the following lines:
   (a) Economic Factors in Meat Production.—Professors Rusk, Carroll, Snapp, Kammlade, and Fairbanks.
   (b) Systems of Livestock Farming.—Professor Case.
   (c) Animal Pathology.—Professor Graham.
   (d) Animal Nutrition.—Professor Mitchell, Associate Professor Hamilton.
   (e) Animal Genetics.—Professor Roberts.
   (f) Poultry Husbandry.—Professor Card.

117. Animal Genetics.—Two to three times a week; both semesters. *One unit.* Professor Roberts.

118. Animal Nutrition Seminar.—A review of current literature in animal nutrition. Two hours a week; both semesters. *One-half unit.* Professor Mitchell.

119. Laboratory Methods in Animal Nutrition.—Two to five times a week; both semesters. *One-half to one unit.* Associate Professor Hamilton.

120. Laboratory Methods in the Diagnosis of Animal Diseases.—Two to five times a week; both semesters. *One-half to one unit.* Professor Graham.

121. Laboratory Methods in Animal Genetics.—Two to five times a week; both semesters. *One-half to one unit.* Professor Roberts.

131. Advanced Course in Animal Nutrition.—Three times a week; second semester. *One unit.* Professor Mitchell.

Courses for Graduates and Advanced Undergraduates

7. Principles of Animal Nutrition.—Five times a week; first semester. Associate Professor Hamilton.

22. Advanced Stock Judging.—Five times a week; first semester. Members of the department.

24. Meat Judging and Special Problems.—Two to five times a week; first semester. Professor Bull.

25. Beef Production.—Three times a week; first semester. Professor Snapp.

26. Pork Production.—Three times a week; first semester. Professor Fairbanks.

27. Sheep Husbandry.—Three times a week; second semester. Professor Kammlade.
28. History of Breeds of Livestock.—Three times a week; second semester. Professor Kammlade and other members of the department.
33. Horse Production.—Three times a week; second semester. Professor Edmonds, Assistant Professor Crawford.
35. Animal Hygiene, Sanitation, Contagious Diseases of Farm Animals.—Twice a week; second semester. Professor Graham, Dr. Boley.
39. Poultry Breeding and Improvement.—Three times a week; first semester. Professor Card.
40. Economics of Poultry Production.—Three times a week; second semester. Professor Card.
41. Animal Genetics.—Three times a week; second semester. Professor Roberts.
43. Animal Nutrition.—Open to students whose major is not animal nutrition. Three times a week; second semester. Associate Professor Hamilton.

ARCHITECTURE AND ARCHITECTURAL ENGINEERING

The prerequisite for graduate work in architecture is the equivalent of the undergraduate courses required for the bachelor's degree in the branches of the subjects in which registration is desired.

Courses for Graduates

101. Architectural Construction.—Theory and design. Twice a week; both semesters. *One-half to two units.* Professor Palmer.
103. Architectural Construction.—Special problems. Twice a week; both semesters. *One-half to two units.* Professor Morgan.
104. Architectural Design.—Advanced course. Both semesters. *One to three units.* Professor Deam.
105. Architectural Practice.—Research in special topics. Once a week; both semesters. *One-fourth to one-half unit.* Professor Provine.
106. Architectural History.—Special research. Twice a week; both semesters. *One-half to two units.* Professor Newcomb.

Courses for Graduates and Advanced Undergraduates

15. History of Architecture.—Medieval architecture. Twice a week; first semester.
16. History of Architecture.—Continuation of Architecture 15. Twice a week; second semester.
17. History of Architecture.—Renaissance. Twice a week; first semester.
18. History of Architecture.—Modern architecture. Twice a week; second semester. Associate Professor O'Donnell.
35-36. Architectural Design (Intermediate).—Four times a week; both semesters. Assistant Professors Scheick and Love.
37-38. Architectural Design (Advanced).—Six times a week; both semesters. Professor Deam, Mr. Keith.
47. Steel Construction.—Lectures and laboratory. Five times a week; first semester. Professor Morgan.
48. Steel Construction.—Continuation of Architecture 47. Five times a week; second semester. Professor Morgan.
57. Reinforced Concrete Theory.—Three times a week; first semester. Professor Palmer.

58. Reinforced Concrete Theory.—Design. Continuation of Architecture 57. Three times a week; second semester. Professor Morgan.
68. Specifications.—Three times a week; both semesters. Professor Provine.
83. Office Practice.—Twice a week; first semester. Professor Provine.

ASTRONOMY

The prerequisites for graduate study in astronomy are mathematics through calculus, a year's course in descriptive astronomy, and a course in college physics.

Courses for Graduates

101. Seminar.—Three times a week; both semesters. *One unit.* Professor Baker.
103. Celestial Mechanics.—Three times a week; both semesters. *One unit.* Professor Baker.

Courses for Graduates and Advanced Undergraduates

7. Celestial Mechanics.—Three times a week; second semester. Professor Baker.
14. Observational Astronomy.—Three times a week; first semester. Professor Baker.
15. Geodetic Astronomy.—Three times a week; first semester. (Not given in 1940-1941.) Professor Baker.

BACTERIOLOGY

Students electing bacteriology as a major for an advanced degree must have had at least ten semester hours of bacteriology and fifteen semester hours of some other physical or biological science.

Bacteriology 8, 20, 26, 103, and 107, or their equivalents, are required for a master's degree. In addition to the usual examinations in courses, each candidate is required to pass a general written examination toward the close of the second semester of residence.

Candidates for a Doctor of Philosophy degree in bacteriology are required to have a general knowledge of bacteriology as applied to plant pathology, dairy bacteriology, and soil biology; appropriate courses in these subjects will be counted, after conference with adviser, toward the requirements for the degree. Those who select a first or second minor in bacteriology must offer at least three units for the first minor and two units for the second minor, exclusive of an introductory course (Bacteriology 20 or its equivalent), selected from the courses offered in this department or, for satisfactory reasons, from certain courses in the related subjects mentioned above, and must include Bacteriology 103 and one advanced laboratory course.

Attention is called to the following courses in other departments, some of which must be elected for advanced degrees in bacteriology: Agronomy 11, 30, 31; Animal Husbandry 35, 112, 120; Botany, 41, 45, 72, 79, 117, 170; Chemistry 29b, 50a, 86a; Dairy Husbandry 10, 106, 112, 113; Horticulture 51, 135; Zoology 18, 31, 118, 121, 128, 131.

Courses for Graduates

103. Physiology of Bacteria.—Twice a week; first semester. *One unit.* Professor Tanner.

107. Research.—For those who are taking a major in bacteriology either for the doctor's or master's degree. Both semesters. *One-half to four units.* Professor Tanner, Assistant Professor Wallace.

118a-118b. Current Literature.—Required of all graduate students whose major is bacteriology. Once a week; both semesters. *One-fourth unit.* Professor Tanner.

Courses for Graduates and Advanced Undergraduates

8. Food and Applied Bacteriology.—Microbiology of foods; food preservation; food-borne infections and intoxications. Five times a week; second semester. Professor Tanner, Assistant Professor Clark.

10. Epidemiology.—Twice a week; second semester. Assistant Professor Wallace.

20. General Bacteriology.—Five times a week; both semesters. Assistant Professor Wallace, Dr. Edwards.

26. Pathogenic Bacteriology.—Five times a week; first semester. Assistant Professor Wallace.

BOTANY

Candidates for advanced degrees in botany must have had at least twenty hours of undergraduate work in botany, including courses 2 (or 12) and 3, or fifteen hours in botany and five hours in a related subject acceptable to the department. Graduate students who elect botany for minor credit must have had fifteen hours in botany, or ten hours in botany and five hours in a related subject acceptable to the department.

Attention is called to courses in agronomy, bacteriology, chemistry, entomology, geography, geology, horticulture, mathematics, physics, physiology, and zoology, which are available to advanced students and offer a broad foundation for the different phases of botanical work. The practical work in plant sciences in the College of Agriculture and the Agricultural Experiment Station offers unusual facilities to graduate students. Joint majors may be arranged in botany and agronomy, or botany and horticulture.

Courses for Graduates

110. Botanical Discussions.—Required of all graduate students. Once a week; both semesters. *One-fourth unit, or no credit.*

112. Discussions in Plant Morphology.—Once a week; both semesters. *One-fourth unit.* Professor Buchholz.

113. Discussions in Plant Physiology.—Once a week; both semesters. *One-fourth unit.* Assistant Professors Fuller and Wynd.

117. Discussions in Plant Pathology and Mycology.—Once a week; both semesters. *One-fourth unit.* Professor Stevens.

118. Discussions in Plant Ecology.—Once a week; both semesters. *One-fourth unit.* Professor Vestal.

133. Advanced Physiology of Growth, Response, and Reproduction.—Once a week; second semester. *One-half unit.* (Not given in 1940-1941.) Assistant Professor Fuller.

134. Chemistry of Plant Products.—Lectures, supervised reading, and reports. Once or twice a week; first semester. *One-half unit.* (Given in 1940-1941 and in alternate years.) Assistant Professor Wynd.

135. Research Technic in Chemical Plant Physiology.—One to three times a week; both semesters. *One-half to one and one-half units.* Assistant Professor Wynd.

172. Epidemiology of Plant Diseases.—Once a week; first semester. *One-half unit.* (Not given in 1940-1941.) Professor Stevens.

Research Courses

120. Plant Morphology.—Once or twice a week; both semesters. *One-half to two units.* Botany 112 to be taken concurrently. Professor Buchholz.

130. Plant Physiology.—Once or twice a week; both semesters. *One-half to two units.* Botany 113 to be taken concurrently. Assistant Professors Fuller and Wynd.

160. Research in Systematic Botany.—Once or twice a week; both semesters. *One-half to one unit.* Dr. G. N. Jones.

170. Plant Pathology or Mycology.—Once or twice a week; both semesters. *One-half to two units.* Botany 117 to be taken concurrently. Professor Stevens.

175. Fruit and Vegetable Disease Research.—Same as Horticulture 135. Three times a week; both semesters. *One unit.* Professor Anderson.

176. Pomological Pathology.—Same as Horticulture 108d. Three times a week; both semesters. *One unit.* Professor Anderson, Assistant Professor Thornberry.

177. Virus Diseases of Plants.—Same as Horticulture 177. Twice a week; second semester. (Given in alternate years; not given in 1940-1941.) *One unit.* Assistant Professor Thornberry.

180. Plant Ecology or Geography.—Once or twice a week; both semesters. *One-half to two units.* Botany 118 to be taken concurrently. Professor Vestal.

Courses for Graduates and Advanced Undergraduates

20. Cytology.—Once or twice a week; second semester. (Not given in 1940-1941.) Professor Buchholz.

33. Plant Physiology.—Growth, and the effect of environment on growth. Once or twice a week; first semester. (Given in 1940-1941 and in alternate years.) Assistant Professor Fuller.

35. Physiology: Metabolic Transformations.—Once or twice a week; second semester. Assistant Professor Wynd.

40. Histological Technic.—Survey of technics used in the preparation of plant tissues for microscopical examination. Once a week; second semester. Dr. Tippo.

41. Algae and Bryophytes.—Morphology and classification. Once or twice a week; second semester. (Not given in 1940-1941).

43. Pteridophytes.—Comparative morphology. Once or twice a week; first semester. (Given in 1940-1941 and in alternate years.) Professor Buchholz.

44. Spermatophytes.—Comparative morphology. Once or twice a week; second semester. (Given in 1940-1941 and in alternate years.) Professor Buchholz.

45. Plant Anatomy.—The internal structure of vascular plants with emphasis on function and evolutionary history. Once a week; first semester. Dr. Tippo.

46. Heredity and Evolution.—The cell in inheritance, environment, adaptation, and evolution. Once or twice a week; first semester. (Not given in 1940-1941.) Professor Buchholz.

51. Fruit or Vegetable Diseases.—Same as Horticulture 51. Three times a week; first semester. Credit is allowed for two successive years; fruit diseases given in even years, and vegetable diseases in odd years. Professor Anderson.

55. Plant Geography of North America.—Regional divisions; climate, soil, topography, vegetation, vegetational history. Once or twice a week; first semester. (Not given in 1940-1941.) Professor Vestal.

56. Plant Geography.—Plants and vegetation of continents other than North America; geographic relations of floras. Once or twice a week; first semester. (Given in 1940-1941 and in alternate years.) Professor Vestal.

60. Advanced Systematic Botany.—Phylogenetic study of flowering plants; relationship of the principal orders and families, problems of nomenclature and the identification of species. Once or twice a week; first semester. (Given in 1940-1941 and in alternate years.) Dr. G. N. Jones.

72. Mycology.—Structure, classification, and identification of fungi, including those of economic importance. Once or twice a week; second semester. Professor Stevens.

79. Research Methods in Plant Pathology.—Once or twice a week; first semester. Professor Stevens.

80. Ecology: Plant Environments.—Analysis of complexes of factors; correlations with plants and with vegetation. Once or twice a week; second semester. (Given in alternate years; not given in 1940-1941.) Professor Vestal.

81. Plant Ecology.—Principles of ecology as exemplified by vegetation and environments of Illinois. Field study on four or five Saturdays. Once or twice a week; first semester. Professor Vestal.

88. Ecology: Plant Communities.—Characteristics, composition, and classes of vegetation units. Once or twice a week; second semester. (Given in 1940-1941 and in alternate years.) Professor Vestal.

BUSINESS ADMINISTRATION

The degree Master of Business Administration is granted to those who complete satisfactorily a course of study which is substantially a fifth year of work in departments of the College of Commerce and Business Administration. The work of such fifth year is supervised by a committee representing the courses in economics, accountancy, and business organization and operation. The degree may be conferred on candidates who have completed satisfactorily the required amount of seminar work and study, and passed a comprehensive examination in the various aspects of business administration—production, personnel, administration, control (accounting and statistics), finance, market distribution, and social responsibility.

For the present, at least, all candidates for the degree must register for full-time graduate study, four units a semester, beginning the first semester and continuing through the second semester.

The requirements for registration in the course leading to the degree are: (1) a bachelor's degree from a recognized college of commerce, school of business, or the equivalent, and (2) a scholastic average in academic subjects substantially above the minimum requirements for that bachelor's degree.

Courses for Graduates

100. Seminar.—Four times a week; both semesters. *Four units.* Professors Littleton, Dillavou, and members of the staffs of the departments of the College of Commerce and Business Administration.

BUSINESS ORGANIZATION AND OPERATION
(Including Accountancy and Business Law)

ACCOUNTANCY

Accountancy may be taken as a major for the degree of Master of Science or Doctor of Philosophy. A student registering in accountancy as a major must have the equivalent of twenty hours of undergraduate work in accountancy and at least one course each in principles of economics and finance. Graduate students in other departments who choose accountancy as a minor must present similar courses, with fifteen instead of twenty hours in accountancy as a minimum.

Accountancy 4a is a prerequisite for 106; 3b for 110; 13 for 113; and 20 for 120.

Courses for Graduates

101. Concepts and Principles.—Twice a week; second semester. *One unit.* Professor Littleton.
103. Income Determination.—Twice a week; first semester. *One unit.* Professor Littleton.
104. Accounting Systems.—Twice a week; both semesters. *One unit.* Professor Scovill.
106. Cost Accounting.—Twice a week; second semester. *One unit.* Professor Schlatter.
107. Surplus and Dividends.—Twice a week; first semester. *One unit.* Professor Littleton.
109. Accounting History.—Twice a week; second semester. *One unit.* Professor Littleton.
113. Governmental Accounting.—Twice a week; first semester. *One unit.* Professor Morey.
120. Income Tax Development.—Twice a week; first semester. *One unit.* Professor Filbey.
129. Thesis.—Once a week; both semesters. *One unit.* Professor Littleton and members of the staff.

Courses for Graduates and Advanced Undergraduates

3a. Advanced Accounting.—Three times a week; both semesters. Associate Professor Theiss, Assistant Professor Newcomer.
3b. Auditing.—Three times a week; both semesters. Professor Filbey, Associate Professor Theiss.
4a. Cost Accounting.—Twice a week; both semesters. Professor Schlatter.
4b. Accounting Systems.—Twice a week; both semesters. Associate Professor Baily.
5a-5b. C.P.A. Problems.—Three times a week; both semesters. Professor Scovill.
13. Governmental Accounting.—Twice a week; both semesters. Assistant Professor Hackett.
20. Income Tax Procedure.—Twice a week; both semesters. Professor Filbey.
30. Budgets and Accounting Control.—Three times a week; both semesters. Associate Professor Theiss.

BUSINESS ORGANIZATION AND OPERATION

Work may be done in the field of business organization and operation for a major or a minor for the Master of Science degree, and for a minor for the Doctor of Philosophy degree. To do major work in this field, a student must have completed at least twenty hours of undergraduate work in marketing, management, business administration, economics, business law, or accountancy. To do minor work in this field, a student must have had at least twelve hours of work in the subjects named above. To do work either in marketing or management, the student must have completed a course in the fundamentals of the subject.

Courses for Graduates

102. Marketing Research and Policies.—Twice a week; both semesters. *One unit.* Professor Converse.
104. Scientific Management.—Modern management methods and procedures, particularly as they apply to industrial enterprises. Twice a week; both semesters. *One unit.* Professor Anderson.
107. Sales Campaigns.—Twice a week; both semesters. *One unit.* Professor Russell.
126. Analysis of Consumer Markets.—Once a week; first semester. *One unit.* (Not given in 1940-1941.)
127. Prices and Price Policies.—Once a week; second semester. *One unit.* (Not given in 1940-1941.)
129. Seminar.—Time to be arranged; both semesters. *One unit.* Professor Russell and others.

Courses for Graduates and Advanced Undergraduates

4. Management in Manufacturing.—Three times a week; both semesters. Professor Anderson.
8. Advertising.—Three times a week; both semesters. Professor Russell.
9. Trade Associations and Commercial Organizations.—Twice a week; second semester. (Not given in 1940-1941.)
17. Problems in Sales Administration.—Twice a week; both semesters. Assistant Professor Beach.
18. Advertising Campaigns.—Three times a week; second semester. Professor Russell.
20. Credits and Collections.—Three times a week; both semesters. Assistant Professor Huegy.
22. Marketing Research and Policies.—Three times a week; first semester. Professor Converse.
25. History of Marketing in the United States.—Three times a week; first semester. Dr. Jones.
32. Contemporary Problems in Marketing Management.—Three times a week; second semester. Assistant Professor Huegy.

BUSINESS LAW

Course for Graduates and Advanced Undergraduates

10. Law of Security Relations and Banking.—Three times a week; both semesters. Professor Dillavou.

CERAMIC ENGINEERING

This department offers graduate work leading to the degrees of Master of Science in Ceramics, Master of Science in Ceramic Engineering, Doctor of Philosophy in Chemistry (Ceramic Chemistry), and Doctor of Philosophy in Engineering.

The prerequisite for a major in graduate work in ceramics or ceramic engineering is proficiency in the undergraduate courses required for the degree of Bachelor of Science in the branch of the subject in which registration is desired, or substantial equivalents.

Candidates for the degree of Doctor of Philosophy in Chemistry (Ceramic Chemistry) must have had the equivalent of at least twenty-five semester hours of satisfactory courses in general, analytical, physical, and organic chemistry; also calculus, one year of college physics, one semester of optical mineralogy, and at least eighteen semester hours or their equivalent in acceptable ceramic courses.

Courses for Graduates

101. Chemistry of the Compounds of Silicon.—Twice a week; both semesters. *One unit.* Professor Parmelee.

102. General Technology of the Silicate Industries.—Twice a week; both semesters. *One to two units.*
   (a) Ceramic Materials and Processes.—Professor Parmelee.
   (b) Drying and Firing Processes.—Professor Hursh.
   (c) Enamels and Equilibrium Studies.—Professor Andrews.
   (d) Refractories.—Professor Andrews.

103. Chemistry of Silicates.—Laboratory to supplement Ceramic Engineering 101, which must precede or accompany it. Both semesters. *One to two units.* Professor Parmelee.

104. Technology of Glass.—Twice a week; second semester. *One to two units.* Professor Parmelee, Assistant Professor Badger.

105. Methods of Ceramic Research.—Twice a week; second semester. *One unit.* Professor Parmelee.

106. Research.—Both semesters. *One to four units.* Professors Parmelee, Hursh, and Andrews.

Courses for Graduates and Advanced Undergraduates

5. Ceramic Bodies.—Five times a week; first semester. Professor Parmelee, Dr. Harman, and assistants.

7. Structural Clay Products.—Three times a week; first semester. Professor Andrews.

8. Glass Technology.—Twice a week; second semester. Professor Parmelee.

10. Cements.—Twice a week; second semester. Mr. Pask.

11. Drying Clay Products.—Three times a week; second semester. Professor Hursh, Mr. Pask.

14. Glasses and Glazes.—Three times a week; second semester. Professor Parmelee, Dr. Harman, and assistants.

16. Enamels.—Three times a week; second semester. Professor Andrews, Mr. Cook.

17. Enamels.—Three times a week; first semester. Professor Andrews, Mr. Cook.

18. Ceramic Microscopy.—Three times a week; both semesters. Mr. Pask.

20. Refractory Materials.—Twice a week; second semester. Professor Andrews.
22. Kilns and the Burning of Clay Products.—Three times a week; first semester. Professor Hursh, Mr. Pask.
23. Dryer and Kiln Design.—Twice a week; first semester. Professor Hursh.
24. Ceramic Engineering Design.—Three times a week; second semester. Professor Hursh and assistant.
28. Pyrochemical Problems.—Twice a week; second semester. Professor Andrews.

CHEMISTRY
(Including Chemical Engineering)

Students who intend to take graduate work for an advanced degree in chemistry or chemical engineering should include in their undergraduate preparation at least the equivalent of one full year of physics, one year of French, one year of German, and mathematics through differential and integral calculus. Any student without the necessary physics or mathematics may enter the Graduate School but will be required to spend part of his time in residence to remove the deficiency. Without one year of college work in French or German (German preferred), no student will be admitted to the Graduate School as a candidate for an advanced degree in chemistry or chemical engineering.

At the time of applying for admission to the Graduate School, each prospective student should notify the Head of the Chemistry Department, stating the degree for which he wishes to study and the field of specialization. Neglect to do this may result in a delay before the student can begin his research, because of the limited space in the laboratories, or may make it impossible for him to continue his work for the Doctor of Philosophy degree. See regulations concerning research under Chemistry 190a-190b.

Candidates for an advanced degree in chemistry or chemical engineering must have had the equivalent of twenty-five semester hours in chemistry, properly distributed.

Candidates for the Master of Arts or Master of Science degree with a major in chemistry or chemical engineering must include among their courses Chemistry 40 and 41, or must have had the equivalent.

Candidates for the Doctor of Philosophy degree in any branch of chemistry must include among their courses Chemistry 40, 41, 42, and 43, or must have had the equivalent.

Candidates for the Doctor of Philosophy degree with a major in chemical engineering must have had undergraduate training comparable to that offered in the chemical engineering curriculum at the University of Illinois. They must include among their courses Chemistry 40, 41, 42, and 44a, or must have had the equivalent.

Graduate students whose major subject is in some department other than chemistry, before taking chemistry courses for graduate credit, must have had the equivalent of fifteen semester hours in chemistry, and the ground covered should include satisfactory work in general chemistry and in qualitative and quantitative analysis and elementary organic chemistry. Such students are advised to make selections from the following courses: Chemistry 40, 41, 42, 43, 27, 36-37, 50, 60a, 15b, 16b, and 29b. Courses of a more special nature

will not as a rule, be accepted for graduate work unless preceded by one of the courses above.

Those who intend to take a first minor in chemistry or any branch of chemistry toward the Doctor of Philosophy degree must include among their courses Chemistry 40 and 41, or must have had the equivalent.

Courses for Graduates

Inorganic Chemistry

101a-101b. Inorganic Chemistry.—The less familiar elements and their relationship in the periodic system. Lectures and recitations. Twice a week; both semesters. *One-half unit.* Dr. Taebel.

102a-102b. Inorganic Chemistry.—Inorganic preparations and qualitative analysis of the less familiar elements. Laboratory to accompany or follow Chemistry 101a-101b. One to three times a week; both semesters. *One-fourth to three-fourths unit.* Dr. Taebel.

105a-105b. Inorganic Chemistry.—Seminar. Current literature. Required of all students whose major is inorganic chemistry. Once a week; both semesters. *One-fourth unit.* Professor Hopkins.

106a. Special Topic in Inorganic Chemistry.—Non-aqueous solvents as media for chemical reactions. Twice a week; first semester. *Three-fourths unit.* Associate Professor Audrieth.

106b. Special Topic in Inorganic Chemistry.—Chemistry of inorganic pigments. Twice a week; second semester. *Three-fourths unit.* Dr. Nicholson.

115a. Inorganic Chemistry.—The periodic relationship of the commercially important elements, their applications and compounds. Lectures, reports, and recitations. Not open to students who have received credit in Chemistry 15a or 15b. Three times a week; first semester. *Three-fourths unit.* Associate Professor Bailar.

116a. Synthetic Inorganic Chemistry.—Advanced inorganic preparations. Laboratory. One to three times a week; first semester. *One-fourth to three-fourths unit.* Associate Professor Audrieth.

Analytical Chemistry

121b. Qualitative Microanalysis.—Conferences and laboratory. Three times a week; second semester. *Three-fourths unit.* Associate Professor Reedy.

123a. Qualitative Analysis.—The principles and methods of analytical chemistry; theory of solutions. Lectures. Required of all graduate students whose major or minor is analytical chemistry. Twice a week; first semester. *One-half unit.* Associate Professor Reedy.

124b. Quantitative Analysis.—A modern survey of advanced principles, calculations, experimental methods and applications. Lectures. Required of all graduate students whose major or minor is analytical chemistry. Twice a week; second semester. *One-half unit.* Professor Smith.

124d. Quantitative Analysis.—Laboratory, optional, to accompany Chemistry 124b. Twice a week; second semester. *One-half unit.* Professor Smith.

125a-125b. Analytical Chemistry.—Seminar. Special topics in analytical chemistry. Required of all graduate students whose major or minor is analytical chemistry. One to three times a week; both semesters. *One-fourth to one unit.* Professor Clark.

126a. Quantitative Instrumental and Chemical Methods of Analysis in Chemical Research.—Spectroscopy, refractometry, spectrophotometry, colorimetry, microscopy, etc. Lectures and laboratory. Three times a week; first semester. *Three-fourths unit.* Associate Professor Englis.

127a-127b. Applied X-rays.—Lectures. Twice a week; both semesters. *One-half unit.* Professor Clark.

127c-127d. Applied X-rays.—Laboratory, optional, to accompany Chemistry 127a-127b. Twice a week; both semesters. *One-half unit.* Professor Clark, Dr. Gross.

Organic Chemistry

130a. Organic Chemistry.—Survey of organic chemistry designed for first-year graduate students. Three times a week; first semester. *One unit.* Professor Fuson.

132b. Organic Chemistry.—Advanced survey of organic chemistry (to follow Chemistry 130a). Three times a week; second semester. *One unit.* Professor Shriner.

133a. Organic Chemistry.—Optical isomerism, cis-trans isomerism, tautomerism, chemistry of the carbohydrates, etc. Twice a week; first semester. *Three-fourths unit.* Professor Adams.

134a-134b. Organic Chemistry.—Advanced organic synthesis. Laboratory. Two to four times a week; both semesters. *One-half to one unit.* Professor Fuson.

135a-135b. Organic Chemistry.—Seminar. Current literature. Once a week; both semesters. *One-fourth unit.* Professor Adams.

136b. Organic Chemistry.—Lectures and laboratory on newer methods in organic laboratory procedure. Twice a week; second semester. *Three-fourths unit.* Professor Shriner.

Physical Chemistry

144a-144b. Physical Chemistry.—Kinetic theory, statistical mechanics, molecular dynamics. Lectures. Twice a week; both semesters. *Three-fourths unit.* Dr. Wall.

145a-145b. Physical Chemistry.—Seminar. Recent development in physical chemistry. Twice a week; both semesters. *Three-fourths unit.* Professor Rodebush.

Biochemistry

150b. Biochemistry.—Chemistry of intermediary metabolism. Lectures and readings. Twice a week; second semester. *Three-fourths unit.* Professor Rose.

152a-152b. Biochemistry.—Difficult biochemical preparations; chiefly laboratory. One to five times a week; both semesters. *One-half to one unit.* Professor Rose.

155a-155b. Biochemistry.—Seminar. Current literature. Required of all graduate students whose major is biochemistry. Twice a week; both semesters. *Three-fourths unit.* Professor Rose.

Chemical Engineering

160a. Flow of Fluids.—Especially designed for first-year graduate students. Lectures. Twice a week; first semester. *One-half unit.* Professor Keyes.

161a. Heat Transmission.—Especially designed for first-year graduate students. Lectures. Twice a week; first semester. *One-half unit.* Assistant Professor Comings.

163a. Evaporation, Drying, Humidification, and Dehumidification.—Lectures. Twice a week; first semester. *One-half unit.* (Given in alternate years; not given in 1940-1941.) Professor Johnstone.

164a. Absorption and Extraction.—Lectures. Twice a week; first semester. *One-half unit.* (Given in 1940-1941 and in alternate years.) Professor Johnstone.

165a-165b. Chemical Engineering.—Seminar. Required of all graduate students whose major is chemical engineering. Once a week; both semesters. *One-fourth unit.* Professor Keyes.

166b. Filtration and Separation.—Lectures. Twice a week; second semester. *One-half unit.* (Given in 1940-1941 and in alternate years.) Professor Johnstone.

167b. Distillation.—Lectures. Twice a week; second semester. *One-half unit.* (Given in alternate years; not given in 1940-1941.) Professor Keyes.

168b. Economic Balance and Plant Design.—Lectures. Twice a week; second semester. *One-half unit.* (Given in alternate years; not given in 1940-1941.) Professor Johnstone.

169b. Catalysis.—Lectures. Twice a week; second semester. *One-half unit.* (Given in 1940-1941 and in alternate years.) Professor Johnstone.

Water Chemistry

185a-185b. The Chemistry of Water Treatment.—Seminar. Special problems and new developments in sanitary chemistry. Once a week; both semesters. *One-fourth to one and one-fourth units.* Professor Buswell.

Miscellaneous

190a-190b. Research.—Candidates for the Master of Arts or Master of Science degree who elect research are required to present a thesis. A thesis is always required of students taking the Doctor of Philosophy degree. Not all candidates for thesis work necessarily will be accepted. Students whose major is in departments other than chemistry must receive permission from the Head of the Chemistry Department to register in this course. Work may be taken in the following fields, subject to the approval of one of the qualified staff members:

Physical and Electrochemistry.—Professors Rodebush and Phipps, Dr. Wall.

Inorganic Chemistry.—Professor Hopkins, Associate Professors Reedy, Audrieth, and Bailar, Dr. Nicholson.

Analytical Chemistry.—Professors Clark and Smith, Associate Professors Reedy and Englis.

Applied X-rays.—Professor Clark.

Food Chemistry; Phytochemistry.—Associate Professor Englis.

Organic Chemistry.—Professors Adams, Marvel, Fuson, and Shriner, Dr. Snyder, Dr. Price, Dr. Emerson.

Colloid Chemistry; Water Chemistry; Zymochemistry.—Professor Buswell.

Biochemistry.—Professor Rose, Assistant Professor Carter.

Chemical Engineering.—Professors Keyes and Johnstone, Associate Professor Swann.

Ceramic Chemistry.—Professor Parmelee.

192a. Chemical Literature and Reference Work.—Once a week; first semester. *One-fourth unit.* Assistant Professor Bartow.

Courses for Graduates and Advanced Undergraduates

Analytical Chemistry

25b. Survey of Analytical Chemistry.—An intensive review of the fundamental principles and procedures of qualitative and quantitative analysis. Three times a week; second semester. Not open to students who have had Chemistry S120. Associate Professor Reedy.

27. Special Methods and Instruments in Quantitative Analysis.—Three times a week; both semesters. Professor Smith.

29b. Food Analysis.—Quantitative organic analysis of food products; alcohols, carbohydrates, fats and oils, cereals, nitrogenous bodies, preservatives, and colors. Six times a week; second semester. Associate Professor Englis.

Organic Chemistry

36. Organic Chemistry.—Second course. Lectures and recitations. Three times a week; both semesters. Professor Marvel, Dr. Snyder.

37. Organic Chemistry.—Organic synthesis. Laboratory, to accompany Chemistry 36. Twice a week; both semesters. Dr. Snyder, Dr. Emerson.

38. Systematic Identification of Organic Compounds.—Identification of pure organic compounds and mixtures. Twice a week; both semesters. Professors Shriner and Fuson.

Physical Chemistry

40. Elementary Physical Chemistry.—Three times a week; both semesters. Professors Rodebush and Phipps.

41. Elementary Physical Chemistry.—Laboratory, to accompany Chemistry 40. Once a week; both semesters. Professor Phipps, Dr. Eddy.

42. Elementary Physical Chemistry.—Three times a week; both semesters. Professor Phipps, Dr. Eddy.

43. Elementary Physical Chemistry.—Laboratory, to accompany Chemistry 42. Once a week; both semesters. Professor Phipps, Dr. Eddy.

44a. Advanced Physical Chemistry.—Thermodynamics and free energy calculations. Twice a week; first semester. Professors Rodebush and Phipps.

46b. Advanced Physical Chemistry.—Atomic structure and valence. Twice a week; second semester. Professor Rodebush.

49b. Chemistry of Colloids.—Preparation and properties of colloids. Special apparatus and technique employed in colloid chemistry. Lectures and demonstrations. Three times a week; second semester. Professor Buswell, Dr. Gore.

Biochemistry

50. Biochemistry.—Proteins, fats, and carbohydrates; tissues, digestion, intestinal putrefaction, and feces; quantitative analysis of gastric contents, blood, and urine. Lectures and laboratory. Five times a week; both semesters. Professor Rose, Assistant Professor Carter, Dr. Vestling.

51b. Problems of Metabolism.—Micro-methods of blood and urine analysis, and their application. Lectures and laboratory. Three times a week; second semester. Assistant Professor Carter.

52b. Biochemistry of Vitamins and Hormones.—Lectures and readings. Twice a week; second semester. Assistant Professor Carter.

Chemical Engineering

60a. Chemical Engineering Unit Processes.—Heat and material balances and design problems. Lectures. Three times a week; first semester. Assistant Professor Deem.

61a-61b. Principles of Chemical Engineering.—Basic principles underlying the design and operation of the chemical engineering unit operations. Lectures. Three times a week; both semesters. Assistant Professor Comings.

62a. Principles of Research and Development.—The fundamental methods used in research and development in chemical industry. Twice a week; first semester. Professor Keyes.

63b. Introduction to Chemical Engineering.—Three times a week; second semester. Assistant Professor Deem.

64b. High Pressure Reactions.—Twice a week; second semester. Assistant Professor Comings.

65b. Chemical Engineering Calculations.—Three times a week; second semester. Professor Johnstone.

67b. Chemical Technology.—Modern industrial chemical processes. Three times a week; second semester. Assistant Professor Deem.

68a-68b. Unit Operations.—Laboratory, to accompany Chemistry 61a and 61b. Once a week; both semesters. Assistant Professor Deem.

69a-69b. Chemical Engineering Projects.—Laboratory. Development of an individual project. Once a week; both semesters. Professor Johnstone.

70b. Economics of Chemical Engineering.—Lectures. Twice a week; second semester. Professor Keyes.

71a. Applied Electrochemistry.—Twice a week; first semester. Associate Professor Swann.

72a. Power Plant and Boiler Water Problems.—Twice a week; first semester. Associate Professor Straub.

Water Chemistry

86a. Chemistry of Water Treatment.—Methods for determining water quality; special water requirements of industries; chemistry of water conditioning for municipal and industrial use; by-product recovery from industrial and other wastes. Lectures, demonstrations, field trips. Three times a week; first semester. Professor Buswell.

Miscellaneous

95a. History of Science with Particular Reference to Chemistry.—Lectures and readings. Twice a week; first semester. Assistant Professor Bartow.

CIVIL ENGINEERING

The prerequisite for graduate work in civil engineering is the equivalent of the undergraduate courses required for the degree of Bachelor of Science in civil engineering in the branches of the subject in which registration is desired.

Courses for Graduates

101. Water Supply.—Design, pumping machinery, administration, operation. Twice a week; first semester. *One unit.* Professor Babbitt.

102. Sewerage.—Sewer design, construction, maintenance, operation, and financing. Twice a week; second semester. *One unit.* Professor Babbitt.

103. Highway Engineering.—A detailed examination of all paving materials and methods of construction; experimental pavements; road improvements; soil stabilization; machinery for highway construction; city, state, and regional planning; airports; and future planning. Twice a week; first semester. *One unit.* Professor Crandell.

104. Municipal Engineering.—City finances and budgets, the work of the city manager and city engineer, zoning, playgrounds and parks, street cleaning, smoke prevention, and fire prevention. Twice a week; second semester. *One unit.* Professor Crandell.

105. Reinforced Concrete Design.—Theories of action of beams, slabs, and columns of reinforced concrete; codes and specifications and their influence on design; effect of continuity. Twice a week; first semester. *One unit.* Professor Shedd.

106. Structural Theory and Design.—General theory of continuity; moment distribution; the column analogy; rigid frame bridges and buildings; fixed and continuous arches; classification of structures from viewpoint of design. Twice a week; first semester. *One or two units.* Professor Shedd.

107. Steel Design.—Design of steel members; codes and specifications for buildings; riveted and welded connections; evolution of bridge specifications; loads and working stresses; economic proportions. Twice a week; second semester. *One unit.* Professor Shedd.

108. Structural Theory and Design.—Statically indeterminate trusses; continuous trusses; steel arches; secondary stresses; suspension bridges; long-span roofs; skeleton steel buildings. Twice a week; second semester. *One or two units.* Professor Shedd.

109. Public Health Engineering.—Design of water purification works and principles of sanitation. Twice a week; first semester. *One unit.* Professor Babbitt.

110. Sewage Disposal, Wastes Disposal, and General Sanitation.—Principles and design of sewage treatment and waste disposal works. Twice a week; second semester. *One unit.* Professor Babbitt.

112. Masonry Construction.—Design and construction of dams, earth embankments, retaining walls, abutments and piers, culverts, grain elevators, and bins. Three times a week; first semester. *One unit.* Professor Huntington.

113. Soil Mechanics and Foundations.—Geological considerations; sub-surface exploration; classification, properties, and tests of rock and soil; stress distribution under foundations; consolidation and settlement; percolation and seepage; spread footings; pile foundations; cofferdams; deep foundations; dam foundations. Three times a week; second semester. *One unit.* Professor Huntington, Assistant Professors Bauer and Newmark.

114. Analytical Study of Tests of Structural Steel Members.—Planning tests, limitations of experimental methods, interpretation of results in terms of design practice. Twice a week; second semester. *One unit.* Professor Wilson.

120. Highway Traffic, Transport, and Safety.—The development, distribution, and characteristics of highway traffic; traffic survey methods and analysis; traffic laws and regulations; traffic control methods and devices; causes and prevention of accidents; accident reports and analysis; safety methods, programs, and education. Twice a week; first or second semester. *One unit.* Professor Wiley.

125. Railway Location and Operation.—Railway location; track capacity; tonnage ratings. Once a week; both semesters; *two units.* Once a week; either semester; *one unit.* Professor King.

130. Hydrology and Flood Control.—Magnitude and frequency of flood flow of streams, minimum flow of streams and regulation of flow by storage reservoirs, intense rainfall and the development of intensity curves for use in rational run-off formula, unit-graph method of computing flood run-off, flood control and prevention by channel improvements, levees, and reservoirs. Twice a week; first or second semester. *One unit.* Professor Pickels.

131. Water Power.—Preliminary investigations, selection of site, storage requirements, structures, machinery, etc. Twice a week; second semester. *One unit.* Professor Doland.

140. Special Problems.—Individual investigations and studies of various phases of civil engineering. Both semesters. *One-half to two units.* Members of the department.

198. Thesis.—Both semesters. *One to two and one-half units.* Members of the department.

Courses for Graduates and Advanced Undergraduates

67-68. Statically Indeterminate Structures.—The elastic theory and its applications in statically indeterminate structures. Three times a week; both semesters. Professor Shedd.

Note.—Other advanced undergraduate courses are available, upon the approval of the adviser and the Dean, to meet the needs of individual students.

THE CLASSICS

For the degree of Master of Arts in the Classics, the major may be either Latin or Greek.

The degree of Doctor of Philosophy is given in classical philology. Major work may be taken in either Latin or Greek, but whichever language is taken as a major, the other one must be taken as a first minor.

GREEK

Preparation for first-year graduate work in Greek should include at least two years of preparatory Greek, two years of college Greek, and two years of college Latin. A reading knowledge of French and German is important for candidates in this subject. The study of history and philosophy is especially recommended.

Courses for Graduates

105a. Aristotle's Ethics.—Twice a week; first semester. *One unit.* Professor Oldfather.

110a-110b. Bibliography and Criticism.—Thesis course. Same as Latin 110. Once a week; both semesters. *One unit.* Professors Oldfather and Canter, Associate Professor Perry.

121. Thucydides.—Twice a week; second semester. *One unit.* Associate Professor Perry.

Courses for Graduates and Advanced Undergraduates

5. Herodotus and the Lyric Poets.—Three times a week; first semester. Associate Professor Perry.

7. Greek Drama: Tragedy and Comedy.—Three times a week; second semester. Associate Professor Perry.

18a-18b. Greek Archaeology.—Twice a week; both semesters. Mr. Dane.

55. History of the Ancient Greek States.—Same as History 55. Three times a week; first semester. Professor Oldfather.

LATIN

Preparation for first-year graduate work in Latin should include at least two years of preparatory Latin and three years of college Latin. A reading knowledge of French and German is important. Some acquaintance with Greek is highly desirable, and the study of history and philosophy is especially recommended.

Courses for Graduates

101. Latin Epigram.—Twice a week; first semester. *One unit.* Professor Canter.

104. Latin Palaeography.—Twice a week; second semester. *One unit.* Professor Oldfather.

110a-110b. Bibliography and Criticism.—Thesis course. Same as Greek 110. Once a week; both semesters. *One unit.* Professors Oldfather and Canter, Associate Professor Perry.

118. Latin Romance.—Twice a week; first semester. *One unit.* Associate Professor Perry.

151. The Annales of Tacitus.—Twice a week; second semester. *One unit.* Professor Canter.

Courses for Graduates and Advanced Undergraduates

10. Latin Composition.—Twice a week; second semester. Associate Professor Perry.

23. Livy, Tibullus, and Propertius.—Three times a week; first semester. Professor Canter.

24. Ovid *(Elegy)* and Seneca *(Epistles* and *Tragedies).*—Three times a week; second semester. Professor Canter.

56. History of the Roman Republic.—Same as History 56. Three times a week; second semester. Professor Oldfather.

DAIRY HUSBANDRY

A graduate student may elect dairy husbandry as his major subject for the degree of Master of Science or Doctor of Philosophy. For either degree a first minor must be taken outside the department, preferably outside the college. If a second minor is elected it may with proper approval be chosen in the department.

Candidates for advanced degrees in dairy husbandry must have had adequate undergraduate training in dairy husbandry, and should have had courses in the following subjects, depending on the field of specialization: chemistry, bacteriology, physics, economics, zoology, genetics, and mathematics.

Courses for Graduates

101. Economic Milk Production.—Twice a week; both semesters. *One-half to two units.* Professor Yapp.

105. Dairy Manufactures.—Both semesters. *One-half to two units.* Professors Ruehe and Tracy, Assistant Professor Tuckey.

106. Dairy Bacteriology.—Assigned problems. Both semesters. *One-half to two units.* Professor Prucha.

107. Dairy Chemistry.—Assigned problems. Both semesters. *One-half to two units.* Professor Overman.

108. Physiology of Lactation.—Both semesters. *One-half to two units.* Professor Gaines.

112. Research.—Graduate students writing theses should so indicate in registering in Dairy Husbandry 112. Both semesters. *One to four units.* Special problems along the following lines:

(a) Dairy Bacteriology.—Professor Prucha.
(b) Dairy Chemistry.—Professor Overman.
(c) Dairy Cattle Breeding.—Professor Yapp.
(d) Dairy Cattle Feeding.—Professor Nevens.
(e) Milk Production.—Professor Gaines.
(f) Dairy Manufactures.—Professors Ruehe and Tracy, Assistant Professor Tuckey.

113. Seminar.—Current literature in dairy bacteriology, dairy chemistry, and dairy manufactures. Once a week; both semesters. *One-half unit.* Members of the Graduate Staff.

114. Seminar.—Current literature relating to various phases of milk production. Once a week; both semesters. *One-half unit.* Professors Gaines, Yapp, and Nevens.

Courses for Graduates and Advanced Undergraduates

5. Composition of Dairy Products.—Three times a week; second semester. Professor Overman.

10. Advanced Dairy Bacteriology.—Three times a week; first semester. Professor Prucha, Assistant Professor Brannon.

17. Advanced Study of Dairy Breeds.—Three times a week; first semester. Professor Yapp.

20. Problems in Dairy Farming.—Three times a week; first semester. Professor Yapp.

25. Advanced Dairy Cattle Feeding.—Twice a week; first semester. (Not given in 1940-1941.) Professor Nevens.

30. Advanced Dairy Manufactures.—Three times a week; second semester. Professor Tracy.

31. Advanced Dairy Manufactures.—Three times a week; first semester. Professor Ruehe, Assistant Professor Tuckey.

32. Plant Management.—Three times a week; first semester. Professor Tracy.

ECONOMICS

Students who wish to make economics their major subject for an advanced degree must have had at least twenty-seven hours of undergraduate work in social science, fifteen of which must have been in economics; the work in economics must include a course in principles of economics, a course in statistics, and other courses for which the course in principles is a prerequisite. Students in other departments who wish to take a minor in economics must have had at least twelve hours in social science, eight hours of which must have been in economics, consisting of a course in principles of economics and other courses for which the course in principles is a prerequisite. Students who cannot meet these requirements may register for graduate work but, unless specially exempted for reasons satisfactory to the adviser in charge, must remove any deficiencies during the first year of residence by taking prescribed courses without graduate credit.

A first-year student whose major is economics must take either Economics 101 or 103 throughout the year. If a minor is taken outside the department, two units of work will ordinarily be required. Undergraduate courses that are approved for graduate credit may be taken in lieu of graduate courses but not to exceed a total credit of two units.

A student who wishes to become a candidate for the Doctor of Philosophy degree with a major in economics must pass a preliminary examination in which he will be held responsible for: (1) a detailed knowledge of economic theory and its history; (2) a detailed knowledge of certain special fields of economics (which may include agricultural economics), the number and selection of which is to be determined by the adviser in consultation with the student; and (3) a general acquaintance with the subject matter and bibliography of other branches

of economics. If a student offers work in some related field outside the department he will be expected to satisfy the examiners as to his proficiency in that subject.

A student who chooses economics as a minor for the Doctor of Philosophy degree must take at least two units of work in the department.

Courses for Graduates

101. Economic Theory.—Planned primarily for students with a minor in economics. Twice a week; both semesters. *One unit.* Assistant Professor Blodgett.

102. Monetary Theory and History.—Twice a week; both semesters. *One unit.* Assistant Professor Nolen.

103. Economic Theory.—Twice a week; both semesters. *One unit.* Associate Professor Whittaker.

104a. Theories and Policies of International Trade.—Twice a week; first semester. *One unit.* Professor Litman.

104b. Organization of International Trade.—Twice a week; second semester. *One unit.* Professor Litman.

105. Public Finance.—Twice a week; both semesters. *One unit.* Professor Hunter.

106. International Exchange and the Money Markets.—Twice a week; second semester. *One unit.* (Not given in 1940-1941.)

107. The Corporation in Economic Evolution.—Twice a week; first semester. *One unit.* (Not given in 1940-1941.) Associate Professor Brown.

109. Theory and Practice of Central Banks.—Twice a week; both semesters. *One unit.*

110. Corporation Finance.—Twice a week; both semesters. *One unit.* Assistant Professor Green.

112. Labor Problems.—Twice a week; both semesters. *One unit.* Assistant Professor McNatt.

118. Seminar.—Thesis course. All graduate students writing theses in economics must register in Economics 118; registration for other students is optional. Both semesters. *One-half to four units.*
(a) Third Year: Seminar.—Professor Litman.
(b) First Year: General Economics.—Associate Professor Brown.

120. History of Economic Thought.—Twice a week; both semesters. *One unit.* Associate Professor Whittaker.

122. Economic History of the United States.—Twice a week; both semesters. *One unit.* Assistant Professor Kemmerer.

123. Industrial and Financial Organization of Society.—Twice a week; both semesters. *One unit.* (Not given in 1940-1941.) Professor Lee.

124. International Economics and Finance.—Twice a week; first semester. *One unit.* Assistant Professor Allen.

136. Investments.—Twice a week; both semesters. *One unit.* Associate Professor Brown.

140. Comparative Economic Systems.—Twice a week; second semester. *One unit.* Assistant Professor Blodgett.

144. Theory and Measurement of Business Cycles.—Twice a week; both semesters. *One unit.* Associate Professor Dickinson.

165. Social Control of Business.—Twice a week; both semesters. *One unit.* (Not given in 1940-1941.) Associate Professor Gray.

170. Economic Statistics.—Twice a week; both semesters. *One unit.* Associate Professor Neiswanger.

180. Economics of Public Utilities.—Twice a week; both semesters. *One unit.* Associate Professor Gray.

192. Economics of Transportation.—Twice a week; both semesters. *One unit.* Associate Professor Locklin.

Courses for Graduates and Advanced Undergraduates

3. Money, Credit, and Banking.—Three times a week; both semesters. Assistant Professor Nolen.

5. Financial History of the United States.—Three times a week; first semester. Assistant Professor Nolen.

6. Principles and Practices of Investment Banking.—Three times a week; second semester. Professor Lee.

8. Money, Prices, and Foreign Exchange.—Three times a week; second semester. Assistant Professor Nolen.

9. Contemporary Banking Practices and Problems.—Three times a week; first semester. Professor Lee.

10. Corporation Finance and Management.—Three times a week; both semesters. Assistant Professor Green and others.

11. Industrial Consolidation.—Three times a week; both semesters. Associate Professor Brown.

15. Economics of Consumption.—Three times a week; either semester. Dr. Weston.

19. Economic Development of the United States, 1820-1860.—Three times a week; first semester. Assistant Professor Kemmerer.

20. Economic Development of the United States since 1860.—Three times a week; second semester. Assistant Professor Kemmerer.

23. Current Economic Problems.—Three times a week; first semester. Professor Lee.

24. Economic Development of Modern Europe.—Three times a week; second semester. Associate Professor Whittaker.

25. Economic History of England.—Three times a week; first semester. Associate Professor Whittaker.

29. Foreign Commerce and Commercial Policies.—Three times a week; second semester. Professor Litman.

30. World Markets.—Three times a week; second semester. Professor Litman.

31. Organization of International Commerce.—Three times a week; first semester. Professor Litman.

36. Investments.—Three times a week; second semester. Associate Professor Brown.

41. Labor Problems.—Three times a week; both semesters. Assistant Professor McNatt.

42. Trade Unionism.—Three times a week; second semester. Assistant Professor McNatt.

44. Comparative Economic Systems.—Three times a week; both semesters. Assistant Professor Blodgett.

51. Public Finance.—Three times a week; both semesters. Assistant Professor Allen.

52. State and Local Finances of Illinois.—Three times a week; second semester. Assistant Professor Allen.

55. Economics of Insurance (Life).—Three times a week; first semester. (Not given in 1940-1941.) Associate Professor Dickinson.

56. Property Insurance.—Three times a week; second semester. Associate Professor Dickinson.

61. Economic Theory.—Three times a week; both semesters.

65. Social Control of Business.—Twice a week; first semester. Associate Professor Gray.
71. Business Statistics.—Three times a week; first semester. Dr. Haworth.
72. Business Barometers.—Three times a week; second semester. Associate Professor Neiswanger.
81. Principles of Public Utilities.—Three times a week; first semester. Associate Professor Gray.
83. Public Utility Rates.—Three times a week; second semester. Associate Professor Gray.
92. Economics of Transportation.—Twice a week; both semesters. Associate Professor Locklin.
93. Industrial Traffic Management.—Three times a week; second semester. Associate Professor Locklin.
94. Ocean Shipping.—Three times a week; first semester. Professor Litman.
96. Current Transportation Problems.—Three times a week; second semester. Associate Professor Locklin.
97. Railroad Finance.—Three times a week; second semester. (Not given in 1940-1941.) Associate Professor Locklin.
98. Railroad Organization.—Twice a week; first semester. (Not given in 1940-1941.) Associate Professor Locklin.
99. Current Economic Problems.—Twice a week; first semester. (Not given in 1940-1941.) Dean Thompson.

EDUCATION

In addition to complying with the general rules of the Graduate School, candidates for the master's degree in education must meet the following requirements: (1) Education 125 is required of all students. (2) Education 11 or 30 is required for students who have not taken a course in the history of education. For students beginning their graduate work in June, 1940, or thereafter, there will be substituted for this requirement a graduate course either in the history of education or in the philosophy of education. (3) Education 6, or the equivalent, is prerequisite for all graduate courses.

Courses for Graduates

101. Philosophy of Education.—Once a week; two hours; both semesters. *One unit.* Associate Professor Browne.
102. Research in History of Education.—Arrange; both semesters. *One unit.* Professor Seybolt.
104. Educational Administration.—Once a week; two hours; both semesters. *One unit.* Professor Weber.
105. Elementary School Organization and Administration.—Once a week; two hours; second semester. *One unit.* Professor Reeder.
106. Organization of Junior and Senior High Schools.—Once a week; two hours; both semesters. *One unit.* Professor Clement.
110. Recent Research in the Teaching of High School Subjects.—Once a week; two hours; both semesters. *One unit.* Professor Monroe.
115. Education and the Problems of Personality.—Once a week; two hours; both semesters. *One unit.* Professor Griffith.
119. Trends and Techniques in Curriculum Making.—Once a week; two hours; first semester. *One unit.* Associate Professor Smith.
120. Supervision of Junior and Senior High Schools.—Once a week; two hours; second semester. *One unit.* Professor Clement.

121. Educational Measurements.—Once a week; two hours; second semester. *One unit.* Associate Professor Odell.

122. Educational and Vocational Guidance.—Once a week; two hours; both semesters. *One unit.* Assistant Professor Finch.

123. Educational Statistics.—Once a week; two hours; first semester. *One unit.* Associate Professor Odell.

124. Techniques in Educational Research.—Once a week; two hours; both semesters. *One unit.* Professor Monroe.

125. Advanced Educational Psychology.—Once a week; two hours; both semesters. *One unit.* Associate Professor Potthoff.

128. The Junior High School.—Once a week; two hours; first semester. *One unit.* Professor Clement.

129. The Junior College.—Once a week; two hours; second semester. *One unit.* Professor Clement.

131. Study of Textbooks and Other Materials of Instruction in Secondary Schools.—Once a week; two hours; first semester. (Not given in 1940-1941.) *One unit.* Professor Clement.

133. Problems of Instruction and Supervision in Secondary Education.—For interns only. Once a week; two hours; first semester. *One unit.* (Not given in 1940-1941.) Assistant Professor Sanford.

134. Curriculum Problems and Trends in Elementary School Reading and the Language Arts.—Once a week; two hours; first semester. *One unit.* Professor Reeder.

135. Curriculum Problems and Trends in Elementary School Social Studies. —Once a week; two hours; first semester. *One unit.* Professor Reeder.

136. Diagnostic and Remedial Programs of the School.—Once a week; two hours; second semester. *One unit.* Assistant Professor Dolch, Dr. Blair.

139. Seminar in Curriculum Problems.—Once a week; two hours; second semester. *One unit.* Associate Professor Smith.

145. Genetic Psychology for Teachers.—Once a week; two hours; second semester. *One unit.* Professor Griffith.

148. Psychology of Secondary School Subjects.—Once a week; two hours; second semester. *One unit.* Associate Professor Potthoff.

150. Thesis.—Both semesters. *One-half to two units.* Dean Benner and others.

170. Public School Finance and Business Administration.—Once a week; two hours; first semester. *One unit.* Professor Weber.

180. Seminar in Elementary Education.—Once a week; two hours; second semester. *One unit.* Professor Reeder.

184. Seminar in School Administration.—Once a week; two hours; second semester. *One unit.* Professor Weber.

185. Seminar in Educational Psychology.—Arrange; both semesters. *One unit.* Professor Griffith, Associate Professor Potthoff, Assistant Professors Finch, Barker, and Dolch, Dr. Blair.

186. Seminar in Secondary Education.—Once a week; two hours; second semester. *One-half unit.* Professor Clement, Assistant Professor Sanford.

187. Seminar in Industrial Education and Guidance.—Once a week; two hours; first semester. *One unit.* Professor Mays.

188. Curriculum Problems and Trends in Industrial Education.—Once a week; two hours; second semester. *One unit.* Professor Mays.

189. Administration and Supervision of Industrial Education.—Once a week; two hours; second semester. *One unit.* (Not given in 1940-1941.) Professor Mays.

190. Research in Education.—Arrange; both semesters. *One unit.* Dean Benner and others.

Courses for Graduates and Advanced Undergraduates

11. Ancient and Medieval Education.—Twice a week; second semester. Professor Seybolt.
18. Educational Measurements.—Three times a week; first semester. Associate Professor Odell.
30. History of American Education.—Twice a week; first semester. Professor Seybolt.
31. Introduction to Modern Theories in Education.—Three times a week; second semester. Associate Professor Browne.
41. Principles of Vocational Education.—Three times a week; both semesters. Professor Mays.
42. Special Education (Superior and Handicapped Children).—Once a week. (Not given in 1940-1941.) Assistant Professor Dolch.
43. Mental Tests.—Three times a week; second semester. Associate Professor Odell.
46. Recent Developments in the Teaching of Elementary School Subjects.—Once a week; first semester. (Not given in 1940-1941). Assistant Professor Dolch.
47. Development of Teaching Units for the Elementary School.—Three times a week; first semester. Assistant Professor Dolch.
52. Part-Time and Evening Schools.—Three times a week; first semester. (Not given in 1940-1941.) Professor Mays.
53. Problems of Industrial Education.—Three times a week; first semester. Professor Mays.
55. Problems of Vocational Guidance.—Three times a week; second semester. Professor Mays.

ELECTRICAL ENGINEERING

The prerequisite for graduate work in electrical engineering is the equivalent of the undergraduate courses required for the degree of Bachelor of Science in electrical engineering in the branches of the subject in which registration is desired.

Graduate students who wish to take a minor in electrical engineering must have had differential and integral calculus, and one year's work in college physics.

Courses offered to junior and senior students in electrical engineering are open for minor credit to students with a major in other departments who have the proper prerequisites.

Courses for Graduates

(The separate courses under the general numbers 101, 102, 103, and 104 may be taken simultaneously.)

101a. Graduate Seminar.—Both semesters. Required. *No credit.*

101. Advanced Courses in Alternating Currents.—Both semesters. *One-half to two units each semester.*
   (b) Circuit Transients.—Professors Knight and Reich.
   (c) Machine Transients.—Associate Professor Keener.
   (d) Symmetrical Components.—Professor Kraehenbuehl, Assistant Professor Faucett.

102. Electric Waves, Oscillations, and Transients.—Both semesters. *One-half to two units each semester.*
   (a) Theory of Energy Radiation.—Professor Brown.
   (b) Principles of Television Engineering.—Professor Brown.

103. Electric Design.—Both semesters. *One to three units each semester.*
(a) Power Plant Design.—Professor Paine.
(b) Machine Design.—Professor Paine.
(c) Illumination Practice and Design.—Professor Kraehenbuehl.

104. Vacuum Tubes and Electronic Control.—Both semesters. *One unit each semester.*
(a) Theoretical Electronics.—Professor Reich.
(b) Vacuum Tubes and Amplifiers.—Professor Reich.
(c) Photoelectric Cells, Gaseous Control Tubes, and Inverters.—Professor Reich.

105. Electrical Engineering Research.—Both semesters. *One to three units.* Professors Paine, Tykociner, Knight, Reich, Brown, and Kraehenbuehl, Associate Professor Keener, Assistant Professor Faucett.

ENGLISH LANGUAGE AND LITERATURE

Students who enter graduate work with English as their major subject are required to give evidence of their ability to write good English. They must present the equivalent of fourteen hours of undergraduate work in English literature, the required college work in rhetoric, and the equivalent of four semesters of college work in Latin, or in Greek, or in French, or in German. After the first year of graduate work a knowledge of French and German is indispensable.

Students making English their minor may be admitted to such courses as in the judgment of the instructor in charge they are qualified to pursue.

The Degree of Master of Arts in English.—In addition to complying with the general rules of the Graduate School, candidates for the degree of Master of Arts in English must comply with the following rules of the Department of English: (1) They must choose most of their work from the group of courses described as "for graduates," and (2) must pass a general examination.

This is a three-hour written examination based upon the knowledge of English and American literature which an undergraduate English major may be reasonably expected to have acquired. It must be taken during the candidate's first term of residence. All students failing to pass the examination during their respective first terms in residence are required to present a total of nine units for that degree, including one unit earned here in a survey course or in such other course as the Committee on Masters' Examinations may determine to be most needed by the individual student. As a guide to the prospective candidates, it is suggested that the following list of undergraduate courses, or their equivalent, will more nearly fit the pattern of the examination than any other: (1) a reading course in ten plays of Shakespeare; (2) a course in one other major writer; (3) a course in a period of literature (e. g., the Renaissance, or the Romantic Period); (4) a survey of English literature.

The Degree of Doctor of Philosophy in English.—Candidates for the degree of Doctor of Philosophy in English may expect to be examined on the entire field of the English language and literature. They are urged, furthermore, to acquaint themselves as fully as possible with the history and philosophy of the period in which their main interest lies, and with the foreign languages and literature most closely related to English and that period.

Courses for Graduates

101. Research in Special Topics.—Both semesters. *One to two units.* Professors Hillebrand, Bernbaum, Paul, T. W. Baldwin, Graham, Jones, Fletcher, Larsen, and Parry, Associate Professor Landis, Assistant Professors Rinaker, Herrick, and Goldman.

107. Old Norse (Old Icelandic).—Introduction to the language; grammar; reading of the Prose Edda in part, and selections from the sagas. Twice a week; both semesters. *One unit.* (Not given in 1940-1941.) Professor Larsen.

108. Old English (Anglo-Saxon).—Three times a week; first semester. *One unit.* Professor Larsen.

109. Old English (Anglo-Saxon).—Beowulf. Three times a week; second semester. *One unit.* Professor Jones.

110. Old English Poetry.—Caedmon and Cynewulf. Twice a week; first semester. *One unit.* Professor Larsen.

112. Seminar in Chaucer.—Once a week; first semester. *One unit.* Professor Jones.

125. Middle English.—Twice a week; second semester. *One unit.* Professor Larsen.

128a-128b. Literature of the Sixteenth Century.—Twice a week; both semesters. *One unit.* (Not given in 1940-1941.) Professor Jones.

129a-129b. English Literature from the Norman Conquest to 1400.—Twice a week; both semesters. *One unit.* Professor Jones.

130a-130b. Tragedy.—Once a week; both semesters. *One unit.* Professor Hillebrand.

135a-135b. Problems in American Literature.—Twice a week; both semesters. *One unit.* Professor Paul.

138a-138b. The Romantic Movement.—Twice a week; both semesters. *One unit.* Professor Bernbaum.

140. Investigations in Modern English Literature.—For second-year and third-year graduate students who are preparing theses for the doctor's degree. Once a week; three hours; both semesters. *One to three units.* May be taken in successive years. Professor Bernbaum.

141a-141b. Literature of the Seventeenth Century.—Twice a week; both semesters. *One unit.* Professor Fletcher.

143a-143b. Seminar in the History and Theory of Prose Fiction.—Once a week; two hours; both semesters. *One unit.* Professor Bernbaum.

145a-145b. Literature of the Eighteenth Century.—Once a week; two hours; both semesters. *One unit.* Professor Graham.

146a-146b. Milton.—Once a week; two hours; both semesters. *One unit.* Professor Fletcher.

147a-147b. Shakespeare and Elizabethan Drama.—Critical study of the chief plays. Twice a week; both semesters. *One unit.* Professor T. W. Baldwin.

148. Seminar in Elizabethan Drama.—Twice a week; first semester. *One unit.* (Not given in 1940-1941.) Professor T. W. Baldwin.

149a-149b. Development of Tudor Drama.—Twice a week; both semesters. *One unit.* Professor T. W. Baldwin.

151a-151b. Studies in the History of the Eighteenth Century Novel.—Twice a week; both semesters. *One unit.* Associate Professor Secord.

153. Seminar in Restoration Drama.—Twice a week; second semester. *One unit.* (Not given in 1940-1941.) Professor Hillebrand.

156. Medieval Latin Literature—Twice a week; second semester. *One unit.* Professor Parry.

157. Seminar in Spenser.—Twice a week; first semester. *One unit.* (Not given in 1940-1941.) Professor Jones.

Courses for Graduates and Advanced Undergraduates

17. History of the English Language.—Three times a week; first semester. Professor Larsen.
25. Chaucer.—Three times a week; first semester. Professor Jones.
26. Spenser.—Three times a week; second semester. Professor Jones.
34. Dr. Johnson and His Circle.—Three times a week; first semester. Assistant Professor Rinaker.
35. The English Drama (Previous to Shakespeare).—Three times a week; first semester. Professor T. W. Baldwin.
36. The English Drama (Exclusive of Shakespeare) from 1600 to 1700.—Three times a week; second semester. Professor Hillebrand.
38. Development of Arthurian Romance.—Three times a week; second semester. (Not given in 1940-1941.) Professor Parry.
54a-54b. Introduction to Comparative Literature.—Three times a week; both semesters. Professors Oldfather, Aron, Van Horne, and Parry, Associate Professors Hamilton and Landis, Dr. Busey.
55a-55b. Survey of English Literature.—Three times a week; both semesters. Professor Parry, Assistant Professor Herrick.
63. Poetry of Milton.—Three times a week; second semester. Professor Fletcher.

SPEECH

Students who enter on graduate work with speech as their major must give evidence of their ability to write good English, and must present the equivalent of fourteen hours of undergraduate work in speech.

Students making speech their minor may be admitted to such courses as in the judgment of the instructor in charge they are qualified to pursue.

Candidates for the degree of Master of Arts in speech, in addition to complying with the general rules of the Graduate School, must (1) pass a general examination and (2) prepare a thesis on some subject approved by the faculty.

Courses for Graduates

101. Research in Special Topics.—Open to candidates for the master's degree in speech. *One to two units.* Associate Professor Parrish, Assistant Professor Windesheim, Dr. Nelson.
114. Seminar in Speech Correction.—Twice a week; both semesters. *One to two units.* Dr. Nelson.
119. Seminar in Speech Science.—Problems in the physics and physiology of speech. Twice a week; both semesters. *One to two units.* Assistant Professor Windesheim.
121a-121b. History of Rhetorical Theory.—Twice a week; both semesters. *One unit.* Associate Professor Parrish, Dr. Dieter.

Courses for Graduates and Advanced Undergraduates

14a-14b. Methods of Speech Correction.—Three times a week; both semesters. Dr. Nelson.
17. Advanced Interpretation.—Three times a week; second semester. Associate Professor Parrish.

18. Pronunciation.—Methods of voice improvement; the sounds of English studied by means of the International Phonetic Alphabet. Three times a week; first semester. Associate Professor Parrish.

19. Speech Science.—Principles of physics involved in the production of speech sounds. Twice a week; first semester. Assistant Professor Windesheim.

20. Speech Science.—Physiology and psychology of human speech. Twice a week; second semester. Assistant Professor Windesheim.

ENTOMOLOGY

The prerequisite for graduate work in entomology is two years of undergraduate biology, including zoology and entomology. A student who chooses entomology as a major for an advanced degree must have had at least six hours of undergraduate courses in entomology. A reading knowledge of French and German is desirable by the beginning of the second year.

Courses for Graduates

100. Research.—Once or twice a week; both semesters. *One-half to four units.*
(a) Morphology and Embryology of Insects.—Professor Hayes.
(b) Economic Entomology.—Professor Metcalf.
(c) Systematic Entomology.—Professor Metcalf, Associate Professor Balduf.
(d) Biology and Ecology of Insects.—Professor Metcalf, Associate Professor Balduf.

107a-107b. Insect Anatomy.—Lectures and laboratory. Three times a week; both semesters. *One unit.* (Given in 1940-1941 and in alternate years.) Professor Hayes.

Courses for Graduates and Advanced Undergraduates

6. Special Problems.—Once or twice a week; both semesters. Members of the department.

8c. Insect Parasites of Man and Domestic Animals and Disease Carriers.—Lectures and laboratory. Three times a week; second semester. (Not given in 1940-1941.) Professor Metcalf.

10a-10b. Morphology and Taxonomy of Immature Insects.—Lectures and laboratory. Three times a week; both semesters. (Given in alternate years; not given in 1940-1941.) Professor Hayes.

20. Insect Control.—Lectures and laboratory. Three times a week; first semester. Professor Metcalf.

21. Insect Bionomics.—Lectures and readings. Three times a week; second semester. (Given in 1940-1941 and in alternate years.) Professor Metcalf.

FRENCH

Students beginning graduate work for an advanced degree in French must have at least three years of college work in French, including one advanced literary course.

Students who have a knowledge of Latin and of a second Romance language, together with a reading knowledge of German, will find their work for an advanced degree greatly facilitated.

Courses for Graduates

101a-101b. Old French Literature.—Twice a week; both semesters. *One unit.* Associate Professor Peckham.

102a-102b. Villon, Rabelais, Montaigne, La Pléiade.—Twice a week; both semesters. *One unit.* Professor Will.

103a-103b. Seventeenth Century Literature.—Twice a week; both semesters. *One unit.* Professor Jackson.

104a-104b. Eighteenth Century Literature.—Twice a week; both semesters. *One unit.* (Not given in 1940-1941.)

127a-127b. Nineteenth Century Literature to 1850.—Twice a week; both semesters. *One unit.* Professor Jackson.

128a-128b. Origin and Development of the Novel in France.—Twice a week; both semesters. *One unit.* (Not given in 1940-1941.)

129a-129b. Research Problems in French Romanticism.—Twice a week; both semesters. *One unit.* (Not given in 1940-1941.)

132a-132b. French Symbolism in Prose and the English and American Influences.—Twice a week; both semesters. *One unit.* (Not given in 1940-1941.)

144a-144b. French Realism and Naturalism.—Twice a week; both semesters. *One unit.* (Not given in 1940-1941.) Professor Jackson.

145a-145b. La Littérature Contemporaine.—(In French.) Twice a week; both semesters. *One unit.* Assistant Professor Jacob.

175a-175b. Old French Phonology and Morphology.—Twice a week; both semesters. *One unit.* (Not given in 1940-1941.)

195a-195b. Seminar.—Research work in special topics. Both semesters. *One to two units.* Professors Jackson and Will, Associate Professor Peckham, Assistant Professor Jacob.

Courses for Graduates and Advanced Undergraduates

10a-10b. General Survey of French Literature.—Three times a week; both semesters. Associate Professor Peckham.

17a-17b. French Drama of the Nineteenth Century.—Twice a week; both semesters. Professor Will.

24a-24b. French Drama of the Seventeenth and Eighteenth Centuries.—Three times a week; both semesters. Professor Will.

32a-32b. French Novel of the Nineteenth Century.—Three times a week; both semesters. Assistant Professor Jacob.

33a-33b. La Littérature Contemporaine.—(In French.) Twice a week; both semesters. (Not given in 1940-1941.) Assistant Professor Jacob.

34a-34b. Balzac and the Social Novel.—Three times a week; both semesters. (Not given in 1940-1941.) Professor Jackson.

35a-35b. Civilisation Française. (Développement de la Culture Française).—(In French.) Twice a week; both semesters. Assistant Professor Jacob.

GENETICS

Those desiring a general training in genetics may take a major or minor in botany or zoology. Those desiring to approach agricultural problems through genetics may take a major or minor in agronomy, horticulture, or animal husbandry. For courses in the subject see departments of Agronomy, Animal Husbandry, Botany, Horticulture, and Zoology.

GEOLOGY AND GEOGRAPHY

GEOLOGY

For graduate work in geology the student must usually have had at least an undergraduate major in geology and an acceptable field training. A major consists of twenty hours in geology, excluding Geology 1, 1a, 43, and 44, and including at least five hours of courses not open to freshmen or sophomores. The following undergraduate courses are recommended: Geology 2, 6, 7, 9, 15, 16, 20, 24, and 33. Graduate students in other departments may nevertheless be admitted to certain graduate courses in geology. A candidate for the master's degree in geology must pass a general written examination toward the close of the second semester of residence, covering the general fields of geology as embraced in the courses listed above and in the graduate courses taken.

Courses for Graduates

101. Advanced Crystallography.—The forms and physical properties of crystallized bodies. Optical properties. Projections and measurements in preparation for x-ray, chemical, ceramic, and geological research. Twice a week; both semesters. *One unit.* (Given in 1940-1941 and in alternate years.) Professor Quirke.

102. Igneous Petrography.—Lectures and laboratory. Twice a week; both semesters. *One unit.* (Given in alternate years; not given in 1940-1941.) Professor Quirke.

123. Geology of the Oceans.—The recent developments in the geological exploration of the oceans and the bearing which the discoveries have on historical and stratigraphic geology. Three times a week; first semester. *One unit.* (Given in alternate years; not given in 1940-1941.) Professor Shepard.

125. Sedimentation.—The interpretation of sedimentary rocks in terms of their origin. Three times a week; first semester. *One unit.* Associate Professor Wanless.

126. Sedimentary Petrology.—Description of sedimentary rocks and cuttings; various methods of analysis of sedimentary rocks and interpretation of results. Two or three times a week; second semester. *One unit.* Associate Professor Wanless.

134. Advanced Studies in Geology.—Studies in metamorphism, pre-Cambrian geology, ore deposition, geophysical prospecting, and other subjects, to be arranged with members of the department. Both semesters. *One-half to four units.*

135. Research.—Once a week; both semesters. *One-half to four units.* Members of the department.

141. Advanced Paleontology.—Morphology, classification, and ecology of the megascopic fossil invertebrates; procedure in taxonomy and description of fossils; methods of paleontological research. Three times a week; second semester. *One unit.* (Not given in 1940-1941.) Associate Professor Sutton.

142. Stratigraphic Geology: Paleozoic.—The invertebrate index fossils of the successive geologic formations. Three times a week; first semester. *One unit.* Associate Professor Sutton.

143. Stratigraphic Geology: Mesozoic and Cenozoic.—Stratigraphic study of the formations with a consideration of characteristic fossils. Three times a week; second semester. *One unit.* Associate Professor Sutton.

145. Micropaleontology.—Classification of microorganisms: foraminifera, ostracodes, conodonts, scolecodonts, and other major groups. Stratigraphic correlation. Three times a week; both semesters. *One unit.* Assistant Professor Scott.

151. Advanced Dynamic Geology.—A critical analysis of geologic processes and their results; the materials and structure of the earth; problems of geologic interpretations. Three times a week; second semester. *One unit.* (Given in 1940-1941 and in alternate years.) Professor Shepard.

152. Advanced Historical Geology.—Cosmogeny; the record of diastrophism; the development of the continents and oceans; the relationship between oceanic fluctuations and organic differentiation and evolution; physiographic, climatic, and organic history. Three times a week; first semester. *One unit.* (Given in alternate years; not given in 1940-1941.) Associate Professor Sutton.

160. Petroleum Geology.—Three times a week; both semesters. *One unit.* (Given in 1940-1941 and in alternate years.) Professor De Wolf.

Courses for Graduates and Advanced Undergraduates

6. Optical Mineralogy.—The optical properties of minerals and use of the petrographic microscope. Emphasis on the identification of crystalline substances by the immersion method. Designed for students in geology, ceramics, agriculture, chemistry, or physics. Three times a week; first semester. Dr. Chapman, Dr. Sharp.

7. Petrology.—Composition, structures, textures, origin, and classification of rocks. Studies of thin sections and hand specimens. Four times a week; second semester. Dr. Chapman, Dr. Sharp.

9. Invertebrate Paleontology.—Fossil groups in biological sequence. Three times a week; first semester. Associate Professor Sutton.

15. Structural Geology.—Rock deformation and its results. Three times a week; second semester. Professor Shepard.

16. Stratigraphy.—Fossil faunas, with special reference to Paleozoic invertebrates, correlation, and stratigraphy. Three times a week; second semester. Associate Professor Sutton.

24. Field Methods and Mapping.—Once a week and three or four one-day field trips and one longer field trip; second semester. Associate Professor Wanless.

33. Geologic Maps.—Studies of geologic and topographic maps with reference to interpretations of stratigraphy, structure, and history. Three times a week; first semester. Associate Professor Wanless.

39. Geology of Illinois.—Stratigraphic and economic geology of Illinois. Three week-end field trips. Lectures, discussions, and reports. Three times a week; first semester. (Given in 1940-1941 and in alternate years.) Associate Professor Wanless.

60a-60b. Introduction to Research.—Two or four times a week; both semesters. Members of the department.

61a-61b. Applied Petroleum Geology.—Primarily for students in the College of Engineering. Three times a week; both semesters. Professor De Wolf.

95. Economic Geology.—The nature, occurrence, origin, and uses of coal, oil, building stones, and bedded deposits of economic importance. Three times a week; first semester. (Given in alternate years; not given in 1940-1941.) Professor De Wolf.

96. Economic Geology.—The nature, occurrence, and origin of metalliferous deposits; theories of ore deposition; factors controlling exploitation. Three times a week; second semester. (Given in alternate years; not given in 1940-1941.) Professor Quirke.

GEOGRAPHY

For graduate work in geography the student must have had at least the equivalent of an undergraduate major in geography. A major consists of twenty hours in geography, excluding Geography 1, and including at least five hours of courses not open to freshmen. Candidates for the master's degree should obtain from the department a copy of special regulations governing a preliminary examination for transfer students and a comprehensive examination near the close of the second semester of residence for all candidates.

Courses for Graduates

134. Advanced Studies in Geography.—Studies in geographical subjects. Both semesters. *One-half to four units.* Professor Blanchard, Assistant Professor Page.

135. Research.—Once a week; both semesters. *One-half to four units.* Professor Blanchard, Assistant Professor Page.

Courses for Graduates and Advanced Undergraduates

8. Geography of Europe.—Three times a week; first semester. Professor Blanchard.

10. Geography of Africa.—Three times a week; second semester. (Given in alternate years; not given in 1940-1941.) Dr. Crist.

11. Geography of Asia.—Three times a week; second semester. (Given in 1940-1941 and in alternate years.) Dr. Booth.

14a. Climate of the Continents.—Three times a week; first semester. (Given in 1940-1941 and in alternate years.) Assistant Professor Page.

53. Production of the Great World Staples.—Three times a week; second semester. (Given in alternate years; not given in 1940-1941.) Professor Blanchard.

54. Advanced Commercial Geography.—Three times a week; second semester. (Given in 1940-1941 and in alternate years.) Professor Blanchard.

60a-60b. Introduction to Research.—Two or four times a week; both semesters. Members of the department.

GERMAN

Students desiring to take German as a major should have completed a four-year course of undergraduate study in German, or its equivalent, and should be familiar with the principal works of the writers of the classical and modern periods of German literature, show a general knowledge of the history of German literature, and be able to follow lectures in the German language.

Of collateral subjects, a reading knowledge of French is important and is required for advanced graduate work. Some acquaintance with Latin and with German history is highly desirable.

Courses for Graduates

101. Seminar in the German Novel.—Twice a week; both semesters. *One unit.* Professor Aron.

Note.—Course 101 is arranged in a three-year rotation: Seminar in Goethe and Schiller, 1941-1942; Seminar in Modern German Drama, 1942-1943. Course S101 is arranged in a two-year rotation: Seminar in Volkskunde With Special Reference to the Volkslied, Summer of 1940, Professor Williams; Seminar in the German Lyric, Summer of 1941, Professor Aron.

102. Thesis.—Both semesters. *One-half to two units.* Professors Aron and Williams, Associate Professor Geissendoerfer, Assistant Professors Jehle and Penzl.

104. Gothic.—Grammar and literature. Twice a week; first semester. *One unit.* Assistant Professor Penzl.

105. Old High German.—Grammar and interpretation of the oldest literary documents. Twice a week; second semester. *One unit.* Professor Williams.

113. German Literature of the Fifteenth and Sixteenth Centuries.—Twice a week; first semester. *One unit.* Professor Williams.

117. German Literature of the Seventeenth and Eighteenth Centuries.—Twice a week; both semesters. *One unit.* (Given in 1940-1941 and in alternate years.) Professor Aron.

121. Walther von der Vogelweide.—Twice a week; second semester. *One unit.* (Alternates with course 121a; not given in 1940-1941.) Professor Williams.

121a. The Nibelungenlied.—Twice a week; second semester. *One unit.* (Alternates with course 121.) Professor Williams.

125. History of the German Language.—Twice a week; second semester. *One unit.* (Not given in 1940-1941.) Assistant Professor Penzl.

127. German Romanticism.—Twice a week; second semester. *One unit.* Associate Professor Geissendoerfer.

Courses for Graduates and Advanced Undergraduates

19a-19b. Goethe's Faust.—The Faust legend and early Faust books and plays; the genesis of Goethe's *Faust;* reading of both parts. Twice a week; both semesters. Associate Professor Geissendoerfer.

26a. German Literature to 1800.—Three times a week; first semester. Professor Aron.

26b. German Literature since 1800.—Three times a week; second semester. Professor Aron.

31. Middle High German.—Twice a week; first semester. Professor Williams.

32. History of German Civilization.—Three times a week; second semester. Assistant Professor Jehle.

HISTORY

Graduate work in history requires two years of college work in this subject, or sixteen semester hours, which should include courses in European and American history equivalent to History 1a-1b and 3a-3b. Linguistic preparation, especially in French and German, is important. For medieval history some knowledge of Latin is essential, and Spanish is useful for certain fields of American history.

Advanced courses in history at the University of Illinois are of three kinds: (1) information and guidance in general reading; (2) instruction in methodology, historiography, and bibliography (a part of this work, course 103, is required of all graduate students in history during their first year). (3) seminars for the study of special fields with a view to training in methods of historical criticism and research.

Illinois Historical Survey.—Students of history have an opportunity to pursue research in western history in connection with the Illinois Historical

Survey, an organization carrying on systematic studies in the history of Illinois. Through the use of materials collected by this survey, graduate students in the department have been given useful training in the study of manuscript as well as of printed material.

Higher Degrees in History.—The following statement regarding the specific requirements for higher degrees in history is subject to the general requirements of the Graduate School.

Master of Arts

Each candidate for this degree ordinarily is required to pass a general written examination early in the year and is expected to devote special attention to two of the following fields: ancient history, medieval history of continental Europe, modern history of continental Europe, English history, American history, Latin-American history, the Near East, the Far East. All candidates are expected to have a general knowledge of historical method (see course 103), and a working knowledge of one important foreign language, ordinarily French or German.

Doctor of Philosophy

Major Requirements.—A candidate who selects history as his major subject should prepare himself for examination in any four of the fields indicated below, stating the particular field in which he wishes to specialize and in which his thesis is to be written:

1. Ancient history. 2. Medieval history of continental Europe, to the close of the thirteenth century. 3. Continental Europe from 1300 to 1648. 4. Continental Europe and its dependencies since 1648 (except as included in 5 and 6). 5. The history of England and its dependencies (not including America before 1783). 6. The history of the United States. 7. The history of Latin America. This enumeration of fields is not to be regarded as excluding the possibility of accepting others as may be determined by the department in individual cases.

Minor Subjects.—A candidate for the doctorate in history may select as his first minor one of the divisions of the field of history listed above which is not offered as a part of his major. He should preferably, however, select his minors from subjects offered by other departments. The following list of suitable minors is intended to be suggestive rather than exhaustive or compulsory.

Political Science.—(Any two acceptable for a first minor; any one, for a second minor.) 1. International law and diplomacy. 2. Modern government. 3. Municipal government. 4. Constitutional and administrative law and jurisprudence. 5. Political theory.

Economics and Sociology.—(Any two acceptable for a first minor; any one, for a second minor.) 1. Economic history. 2. Economic theory. 3. Public and private finance. 4. Social reform. 5. Principles of sociology.

Philosophy and Education.—(Any two acceptable for a first minor; any one, for a second minor.) 1. History of ancient and medieval philosophy. 2. History of modern philosophy. 3. History of education.

Literature.—Some division of the history of literature which may be either comparative literature of a limited period or the literature of a particular country for a more extended period as may be agreed upon in each case.

Courses for Graduates

101a-101b. Seminar in American History.—Once a week; two hours; both semesters. *One unit.* Semester I: Introduction to research. Professor Robertson. Semester II: Investigation of selected topics. Professor Randall.

102a-102b. Seminar in English History.—Once a week; two hours; both semesters. *One unit.* Semester I: The reign of Henry VIII, 1509-1520. Semester II: The early years of Elizabeth's reign, 1558-1570. Professor Dietz.

103. Historical Method.—Required of all candidates for an advanced degree in history who do not present evidence of similar training elsewhere. Twice a week; first semester. *One unit.* Professor Randall.

104a-104b. Seminar in Modern History.—Once a week; two hours; both semesters. *One unit.* Professor Lybyer.

105. Research in Special Topics.—Guidance in writing theses for advanced degrees. Both semesters. *One to two units.* Professors Robertson, Lybyer, Pease, Jones, Randall, Dietz, Swain, and Rodkey, Associate Professor Shannon, Assistant Professors Dunbar, Werner, Stearns, and Erickson.

106a-106b. Seminar in Medieval History.—Arrange hours; both semesters. *One unit.* (Not given in 1940-1941.)

117a-117b. Seminar in the Social History of the United States.—Social aftermath of the Civil War and the World War: agrarian unrest; immigration, urbanization, intellectual interests. Once a week; two hours; both semesters. *One unit.* Associate Professor Shannon.

122a-122b. History of the West.—An intensive study of the westward movement, 1740-1765. Once a week; two hours; both semesters. *One unit.* Professor Pease.

126. Spain in Europe and America, 1750-1870.—Bibliography, historiography, and topical reports. Arrange hours; first semester. *One unit.* Professor Robertson.

127. Inter-American Relations.—Relations of the Latin-American nations with each other and with the United States. The Monroe Doctrine, intervention, etc. Arrange hours; second semester. *One unit.* Professor Robertson.

133a-133b. Seminar in the History of Europe, 1815-1878.—Once a week; two hours; both semesters. *One unit.* Professor Rodkey.

138a-138b. Seminar in the History of France, 1515-1700.—Arrange hours; both semesters. *One unit.* Professor Jones.

150a-150b. Seminar in Ancient History.—Arrange hours; both semesters. *One unit.* Professor Swain.

Courses for Graduates and Advanced Undergraduates

16a-16b. Foundations of American Society, 1700-1789.—Three times a week; both semesters. Assistant Professor Dunbar.

17a-17b. Social and Economic Forces in the United States since 1800.—Three times a week; both semesters. Associate Professor Shannon.

19. American Immigration: Colonial and National Periods.—Twice a week; second semester. Assistant Professor Werner.

20. The South, Old and New.—Three times a week; first semester. Professor Randall.

21. History of the United States since 1877.—Three times a week; second semester. Professor Randall.

22a-22b. History of the West, 1634-1830.—Twice a week; both semesters. Professor Pease.

25. The Civil War and Reconstruction.—Three times a week; first semester. Associate Professor Shannon.

26. Latin-American Colonies to 1824.—Three times a week; first semester. Professor Robertson.

27. Latin America since 1824.—Three times a week; second semester. Professor Robertson.

29. America and Europe, Selected Topics, 1776-1900.—International problems, the Monroe Doctrine, etc. Three times a week; second semester. Professor Robertson.

32a-32b. European History since 1878.—Three times a week; both semesters. Professor Lybyer.

34a-34b. Development of Modern Europe, 1648-1848.—Three times a week; both semesters. Assistant Professor Stearns.

36a-36b. Development of Modern Germany.—Three times a week; both semesters. Professor Rodkey.

37a-37b. Eastern and Southern Asia.—Twice a week; both semesters. Professor Lybyer.

38a-38b. Development of the French Monarchy since 1285.—Three times a week; both semesters. Professor Jones.

39a-39b. Europe During the Renaissance and the Reformation.—Three times a week; both semesters. (Not given in 1940-1941.) Professor Jones.

44a-44b. Constitutional History of England.—Three times a week; both semesters. Professor Dietz.

46a-46b. Social and Economic History of England since 1750.—Three times a week; both semesters. Professor Dietz.

47a-47b. History of England, 1377-1603.—Three times a week; both semesters. (Not given in 1940-1941.) Professor Dietz.

55. History of the Ancient Greek States.—Three times a week; first semester. Professor Oldfather.

56. History of the Roman Republic.—Three times a week; second semester. Professor Oldfather.

57a-57b. Ancient Imperialism, Hellenistic and Roman.—Three times a week; both semesters. Professor Swain.

60. The United States in the World War.—Three times a week; second semester. Professor Pease.

62a-62b. Constitutional Development of the United States.—Three times a week; both semesters. Professor Randall.

HOME ECONOMICS

As preparation for graduate work with a major in foods and nutrition, the student must have had at least the equivalent of the foods and nutrition required in the undergraduate curriculum for the general major in home economics; also three to five hours in foods, dietetics, and nutrition; and a course in quantitative chemical analysis.

As preparation for graduate work with a major in general home economics, a student must have had the equivalent of the undergraduate curriculum for the general major in home economics, including a course in the principles of economics.

In addition to graduate courses in home economics the student will offer, for a major in foods and nutrition, either Chemistry 50 or 40 and 41, and for the general major, further courses in education, economics, or sociology.

Graduate students who choose home economics as a minor for the degree of Doctor of Philosophy must have had adequate preliminary preparation in foods and nutrition and must include among the courses to be taken for the minor either Home Economics 41 and 103 or 35 and 105, or must have had their equivalent. Of the courses open to advanced undergraduates, selection may be made from courses 20, 33, 35, 39a, 39b, and 41.

Courses for Graduates

101. Problems in Family Living.—Twice a week; both semesters. *One unit.* Professor Bane, Associate Professor Perkins.
102. Research in Nutrition.—Both semesters. *One-half to three units.* Professor Outhouse.
103. Seminar in Nutrition.—Once a week; both semesters. *One-half unit.* Professor Outhouse.
104. Research in Foods.—Second semester. *One-half to three units.*
105. Seminar in Foods.—Once a week; second semester. *One-half unit.*

Courses for Graduates and Advanced Undergraduates

20. Physical Growth and Nutrition.—Twice a week; first semester. Professor Outhouse.
28. Organization and Management of the Home.—Twice a week; second semester. Professor Bane, Assistant Professor Sorenson.
31. Clothing.—Three times a week; second semester. Assistant Professor Whitlock.
33. Diet in Disease.—Three times a week; both semesters. Assistant Professor Barto.
39a-39b. Readings in Food and Nutrition.—Once a week; both semesters. Professor Outhouse, Assistant Professor Barto.
41. Problems in Nutrition.—Three to five times a week; second semester. Professor Outhouse.
43a-43b. Problems in Textiles and Clothing.—Three times a week; both semesters. Assistant Professor Jacobsen, Miss Eades.
48. Institution Dietaries and Administration.—Three times a week; second semester. Assistant Professor Smith.
50. Costume Design.—Twice a week; second semester. Miss Eades.
51. Textiles.—Three times a week; second semester. Assistant Professor Jacobsen.
56. The Child and His Development.—Twice a week; both semesters. Associate Professor Perkins.
57a-57b. Problems in Home Management.—Three times a week; both semesters. Professor Bane, Assistant Professor Sorenson.

HORTICULTURE

Graduate work is offered in the Department of Horticulture leading to the Master of Science and Doctor of Philosophy degrees. Candidates may specialize for either degree in floriculture, pomology, or vegetable crops.

Twenty hours of undergraduate work in horticulture and allied subjects are required of students who choose horticulture as a major, and twelve hours are required of those who select it as a minor. The department will waive certain of these requirements for some fields of major study if the student has

had an equivalent preparation in the fundamental sciences. It is desirable when the major field of study is decided upon during the junior or senior year, to select the fundamental science courses accordingly, and if possible, to include in the undergraduate preparation the elementary courses in German or French.

Advanced work in botany, chemistry, entomology, agronomy, or agricultural economics may advantageously be taken with horticulture to make a well-balanced course of graduate study.

Courses for Graduates

103. Vegetable Crops.—Once a week; both semesters. *One to two units.* Professor Huelsen.

106. Vegetable Crops Seminar.—Once a week; first semester. *One-fourth unit.* Professor Huelsen.

108. Pomology.—Three times a week; both semesters. *One to four units.*
(a) Pomology and Fruit Breeding.—Professor Dorsey.
(b) Pomological Physiology.—Professor Ruth.
(c) Small Fruits.—Professor Colby.
(d) Pomological Pathology.—Professor Anderson, Assistant Professor Thornberry.

115. Floriculture.—Once a week; both semesters. *One to two units.*
(a) Floricultural Problems.—Professor Dorner.
(b) Floricultural Physiology and Pathology.—Associate Professor Weinard.

120. Pomology Seminar.—Once a week; both semesters. *One-fourth unit.* Professors Dorsey, Ruth, Anderson, and Colby.

125. Fruit Development.—Three times a week; first semester. *One unit.* Professor Dorsey.

130. Physiology of Fruit Production.—Three times a week; first semester. *One unit.* Professor Ruth.

135. Fruit and Vegetable Disease Research.—Same as Botany 175. Three times a week; both semesters. *One unit.* Professor Anderson, Assistant Professor Thornberry.

140. Advanced Small Fruit Culture.—Three times a week; second semester. *One unit.* Professor Colby.

177. Virus Diseases of Plants.—Same as Botany 177. Twice a week; second semester. *One unit.* (Given in alternate years; not given in 1940-1941.) Assistant Professor Thornberry.

Courses for Graduates and Advanced Undergraduates

12. Evolution of Horticultural Plants.—History, classification, and distribution of cultivated plants; modification under culture; variation; methods. Three times a week; first semester. (Given in alternate years; not given in 1940-1941.) Professor Dorsey.

43. Floricultural Physiology.—Three times a week; first semester. Associate Professor Weinard.

44. Current Pomological and Vegetable Crops Literature.—Once a week; both semesters. This course may be taken for four successive semesters, designated as Horticulture 44a, 44b, 44c, and 44d. Professor Ruth.

45. Plant Nutrition.—Three times a week; second semester. Associate Professor Weinard.

46. Marketing Horticultural Products.—See Agricultural Economics 36. (Not given in 1940-1941.)

51. Fruit or Vegetable Diseases.—Same as Botany 51. Three times a week; first semester. Credit allowed for two successive years; fruit diseases given in even years and vegetable diseases in odd years. Professor Anderson.

55. Vegetable Physiology.—Horticultural applications of the various physiological processes and plant responses. Three times a week; first semester. Assistant Professor McCollum.

56. Growing Vegetable Crops for Manufacture.—Special problems of vegetable crops grown on a large scale for processing. Farm and factory requirements coordinated from the standpoint of varieties, breeding, culture, handling, and quality. For those interested in growing vegetables for canning and freezing. Three times a week; second semester. Professor Huelsen.

LIBRARY SCIENCE

Before beginning work for the Master of Science degree in library science, students must have acquired the degree of Bachelor of Science in library science, or its equivalent in an approved institution, with good scholastic records. They must also present approved experience, a reading knowledge of two modern foreign languages, one of which must be German or French, and recommendations as to professional promise.

A student may combine a major in library science with a minor in any special subject for which he is adequately prepared.

The thesis must be completed within three years after first registration therein, unless there is approval of a longer period based upon unusual contingencies.

Application forms may be secured from the Library School office.

Courses for Graduates

101. Thesis.—Both semesters. *One to two units.* Director White and others.

102. Seminar.—Both semesters. *One-half to four units.*

(b) University Library Administration.—*One unit.* (Not given in 1940-1941.)

(c) Publishers.—*One unit.* (Not given in 1940-1941.)

(d) Special Libraries.—

(e) Individual Problems.—Both semesters. *One-half to one unit.* Associate Professors Bond, Boyd, and others.

(g) Social Trends.—Once a week; two hours; second semester. *One unit.* Dr. Spencer.

(h) Methods of Investigation in Librarianship.—Twice a week; first semester. *One-half unit.* Dr. McDiarmid.

103a-103b. Advanced Reference.—Twice a week; both semesters. *Three-fourths unit each semester.* Dr. Spencer, Miss Phelps.

104a. Advanced Classification.—Once a week; two hours; first semester. *One-half unit.* Associate Professor Bond.

104b. Advanced Cataloging.—Once a week; two hours; second semester. *One-half to one unit.* Associate Professor Bond.

Courses for Graduates and Advanced Undergraduates

13a. United States Government Publications.—Production, distribution, and use of federal publications as reference material. Twice a week; first semester. *Three-fourths unit.* Associate Professor Boyd.

24a. Book Selection for Special Groups.—Foreign literature in translation. Twice a week; first semester. *Three-fourths unit.* (Not given in 1940-1941.)

24b. Book Selection for Special Groups.—Selection for socially maladjusted groups; retarded reading groups; therapeutic values of reading. Twice a week; first semester. *One-half unit.* Assistant Professor Hostetter.

42. State, Municipal, and Foreign Government Publications.—The use of American state and municipal documents, League of Nations publications, and foreign government publications as reference material. Three times a week; second semester. *Three-fourths unit.* Miss Phelps.

44. Bookbuying for the Large Library.—Twice a week; second semester. *One-half unit.* (Not given in 1940-1941.)

45. Library Buildings and Equipment.—Twice a week; first semester. *One-half unit.* (Not given in 1940-1941.)

46. High School Library Administration.—Three times a week; second semester. *One-half unit.* Assistant Professor Hostetter.

48. Library Administration.—Special problems. Three times a week; second semester. *One-half unit.* (Not given in 1940-1941.)

49. Children's Literature.—Twice a week; second semester. *One-half unit.* Assistant Professor Hostetter.

51. Books and Libraries.—Three times a week; second semester. *One-half unit.* Miss Singleton.

52. Reading Guidance.—Twice a week; second semester. *One-half unit.* Associate Professor Boyd.

MATHEMATICS

Students beginning graduate study with a major in mathematics must have had twenty hours of undergraduate work in mathematics besides the usual freshman courses in algebra, trigonometry, and analytic geometry, including a one-year course in calculus and one year of more advanced work in one or more of the fields of algebra, analysis, and geometry. They should be able to read German or French.

Candidates for a Doctor of Philosophy degree taking a first minor in mathematics are expected to have completed a course in calculus and are required to take two one-year courses beyond the calculus. Those taking a second minor are required to complete at least one course throughout a year beyond the calculus.

The more technical courses offered by the department are arranged mainly in cycles of two or of three years, so that a properly qualified student will usually have opportunity to take any particular course at some time during the three years of residence required for the doctor's degree.

Courses for Graduates

100. Seminar.—For thesis work, or for special reading with the consent of the instructor. Three times a week; both semesters. *One to two units.* Professors Coble, Carmichael, Crathorne, Brahana, and Trjitzinsky; Associate Professors Hazlett and Baer, Assistant Professors Levy, Doob, and Bourgin. For the master's degree: Assistant Professors Bailey and Ketchum, Dr. Steimley, Dr. Pepper, Dr. Miles, Dr. Chanler, Dr. Duffin, Dr. Fox, Dr. Vaughan, Dr. Helmer, Dr. Niven.

101. Functions of Real Variables.—Three times a week; both semesters. *One unit.* Assistant Professor Doob.

102. Functions of a Complex Variable.—Three times a week; both semesters. *One unit.* (Not given in 1940-1941.)

104. Topology.—Three times a week; second semester. *One unit.* Dr. Fox.

109. Seminar in Research Topics.—Time to be arranged; both semesters. *One unit.* Professor Carmichael.

110. Elliptic Functions.—Three times a week; both semesters. *One unit.* (Not given in 1940-1941.) Professor Carmichael.

111. Differential Equations.—Three times a week; both semesters. *One unit.* (Not given in 1940-1941.) Professor Trjitzinsky.

112. Linear Difference Equations.—Three times a week; both semesters. *One unit.* (Not given in 1940-1941.) Professor Carmichael.

115. Advanced Topics in the Theory of Functions.—Modern aspects of the theory of functions of a real and of a complex variable. Three times a week; both semesters. *One unit.* (Not given in 1940-1941.) Professor Trjitzinsky.

116. Topics in Classical Analysis.—Three times a week; first semester. *One unit.* Dr. Duffin.

124. Theory of Numbers.—Three times a week; second semester. *One unit.* Dr. Niven.

126. Theory of Groups.—Three times a week; both semesters. *One unit.* (Not given in 1940-1941.)

127. Fundamentals of Geometry.—An analysis of the axioms of projective and Euclidean geometry from the points of view of modern algebra and topology. Three times a week; first semester. *One unit.* Associate Professor Baer.

128. Continuous Groups.—Three times a week; second semester. *One unit.* Associate Professor Baer.

129. Theory of Statistics.—Three times a week; both semesters. *One unit.* Professor Crathorne.

131. Advanced Geometry.—Three times a week; both semesters. *One unit.* Assistant Professor Levy.

151. Linear Operations.—Three times a week; both semesters. *One unit.* (Not given in 1940-1941.) Assistant Professor Bourgin.

169. The Elements of Higher Geometry and Algebra.—Three times a week; both semesters. *One unit.* Professor Brahana.

170. Algebra.—Three times a week; both semesters. *One unit.* Associate Professor Hazlett.

171. Analysis.—Three times a week; both semesters. *One unit.* Dr. Helmer.

172. Geometry.—Three times a week; both semesters. *One unit.* Professor Coble.

Courses for Graduates and Advanced Undergraduates

16-17. Differential Equations and Advanced Calculus.—Three times a week; both semesters. Dr. Steimley.

18-19. Advanced Calculus.—Three times a week; both semesters.

21. Theory of Probability.—Three times a week; second semester. Professor Crathorne.

22. Statistics.—May be counted only toward a minor in mathematics. Three times a week; first semester. Dr. Welker.

30-31. Actuarial Theory.—Three times a week; both semesters. Dr. Bower.

32. History of Mathematics.—Three times a week; second semester. (Not given in 1940-1941.) Assistant Professor Moore.

35. Teachers Course.—May be counted only toward a minor in mathematics. Three times a week; both semesters. Assistant Professor Bailey.

36. Advanced Aspects of Euclidean Geometry.—Three times a week; second semester. Assistant Professor Moore.

40a-40b. Fundamental Concepts of Mathematics.—Three times a week; both semesters. Dr. Pepper.

70a-70b. Introduction to Higher Algebra.—Three times a week; both semesters. (Not given in 1940-1941.)

71a-71b. Introduction to Higher Analysis.—Three times a week; both semesters. Assistant Professor Ketchum, Dr. Vaughan.

72a-72b. Introduction to Higher Geometry.—Three times a week; both semesters. Dr. Chanler.

MECHANICAL ENGINEERING

The prerequisite for graduate work in mechanical engineering is the equivalent of the undergraduate course required for the degree of Bachelor of Science in mechanical engineering in the branch of the subject in which registration is desired. Courses offered to junior and senior students are open for minor credit to students whose major is in other departments.

Courses for Graduates

107. Thermodynamics.—Mathematics of thermodynamics; application of thermodynamics to the solution of physical and engineering problems. Twice a week; both semesters. *One unit.* (Not given in 1940-1941.)

108. Flow of Fluids and Heat Transfer.—Application of dimensional analysis and other rational formulas. Special problems. Twice a week; both semesters. *One unit.* Professor Macintire.

109. Mechanical Engineering Design.—Machine design, power plant design, dynamics of machinery. Twice a week; both semesters. *One unit.* Professors Leutwiler and Ham.

110. Advanced Heating, Ventilating, and Air Conditioning.—Applications of various systems, notable developments, results of research. Individual problems. Twice a week; both semesters. *One unit.* Professor Severns.

112. Laboratory Investigations.—Special problems in: (a) combustion; (b) steam; (c) gas and oil engineering; (d) heating, ventilation, and air conditioning; (e) refrigeration; (f) flow of fluids; (g) heat transfer; (h) mechanical transmission of power; (i) railway equipment. Three times a week; both semesters. *One and one-half units.* Professors Polson, Kratz, Ham, Macintire, Severns, and Young.

117. Advanced Refrigerating Engineering.—Advanced theory and special cycles; design of comfort cooling and other special installations. Twice a week; both semesters. *One unit.* Professor Macintire.

120. Locomotive Design.—Economic and legal considerations; specifications; weight and distribution; relation of steam pressure, compounding, and superheat to performance and economy. Both semesters. *One unit each semester.* Professor Young.

121. Locomotive Operation.—Train resistance and locomotive tractive force; tonnage ratings. Both semesters. *One unit each semester.* Professor Young.

MINING AND METALLURGICAL ENGINEERING

MINING ENGINEERING

The prerequisite for graduate work with mining engineering as a major is the equivalent of the undergraduate courses required for the degree of Bachelor of

Science in mining engineering. Courses for advanced undergraduates are open for minor credit to students whose major is in other departments who have the necessary prerequisites including physics, calculus, and mechanics.

Courses for Graduates

101. Advanced Mining Practice.—Twice a week; both semesters. *One unit.* Assistant Professor Nicholson.

102. Advanced Preparation of Coal and Ores.—Twice a week; both semesters. *One unit.* Assistant Professor Nicholson.

104.[1] Mining Reports.—Twice a week; both semesters. *One unit.* Assistant Professor Nicholson.

105.[1] Welfare Work and Education among Mine Employees.—Twice a week; both semesters. *One unit.* Assistant Professor Nicholson.

Courses for Graduates and Advanced Undergraduates

6. Mechanical Engineering of Mines.—Three times a week; first semester.

8. Mine Administration.—Three times a week; first semester. Assistant Professor Nicholson.

9. Preparation of Coal and Ores.—Three times a week; first semester. Assistant Professor Nicholson.

15. Mine Ventilation.—Twice a week; second semester.

20. Mine Ventilation Laboratory.—Twice a week; second semester.

21. Mine Examination and Valuation.—Three times a week; second semester. Assistant Professor Nicholson.

41. Mining Design.—Three times a week; first semester.

42. Mining Design.—Twice a week; second semester.

64. Coal and Ore Preparation Laboratory.—Twice a week; second semester. Assistant Professor Nicholson.

METALLURGICAL ENGINEERING

The prerequisite for graduate work with metallurgical engineering as a major is the equivalent of the undergraduate courses in process and physical metallurgy and in mechanics of materials required for the degree of Bachelor of Science in metallurgical engineering. Courses for advanced undergraduates are open for minor credit to students whose major is in other departments who have adequate preparation in physics and chemistry. Mechanics of materials is prerequisite for Metallurgy 7, 8, and 10.

Courses for Graduates

101. Research in Metallurgy.—Both semesters. *One to two units.* Assistant Professors Walker and Bruckner.

102. Advanced Physical Metallurgy.—Twice a week; first semester. *One unit.* Assistant Professor Walker.

103.[2] Advanced Metallography: Ferrous Alloys.—Twice a week; second semester. *One unit.* Assistant Professor Walker.

104.[2] Advanced Metallography: Non-Ferrous Alloys.—Twice a week; second semester. *One unit.* Assistant Professor Walker.

[1]Of courses 104 and 105 only one will be given each semester, according to election of students.

[2]Of courses 103 and 104 only one will be given, according to election of students.

Courses for Graduates and Advanced Undergraduates

1. Elements of Metallurgy.—Three times a week; first semester.
2. Principles of Metallurgy.—Three times a week; first semester.
4. Physical Metallurgy.—Three times a week; first semester.
5. Ferrous Metallurgy.—Three times a week; second semester.
6. Metallurgical Calculations.—Twice a week; second semester.
7. Ferrous Metallography.—Three times a week; first semester. Assistant Professor Walker.
8. Ferrous Metallography Laboratory.—Twice a week; first semester.
9. Non-Ferrous Metallurgy.—Three times a week; first semester.
10. Non-Ferrous Metallography.—Three times a week; second semester. Assistant Professor Walker.
11. Electrometallurgy.—Three times a week; second semester.
12. Metallography.—Three times a week; second semester.
13. Utilization of Fuels.—Three times a week; second semester.
41. Metallurgical Design.—Three times a week; first semester.
42. Metallurgical Design.—Twice a week; second semester. Assistant Professor Walker.

MUSIC

An applicant for admission to the Graduate School as a candidate for the degree of Master of Music or the degree of Master of Science in Music Education is required to have finished successfully a four-year undergraduate curriculum in music or in music education.

A graduate with a degree in music from an institution which holds membership in, or is listed by, the Association of American Universities, or from a liberal arts college recognized by the North Central Association or equivalent regional accrediting association, will be admitted without a qualifying examination.

A candidate who holds a bachelor's degree from an independent conservatory or school of music will be considered under the following conditions: (1) The degree must be based on a four-year curriculum in music. (2) The undergraduate work presented for the degree must include not less than eighteen hours (thirty hours for Music Education curriculum) in academic subjects, with not less than the equivalent of two years of college work in foreign languages, one year of which must be in French or German completed in college. (3) The applicant must pass a qualifying examination in the branch of music which he wishes to pursue as his major field in graduate study, given under the supervision of the Director of the School of Music.

For the degree of Master of Music, the major field may be in musicology, music theory and composition, music literature, or band and orchestra conducting. For the field of musicology, a reading knowledge of both German and French is highly desirable.

Courses for Graduates

100a-100b. Contrapuntal Forms of Composition.—Twice a week; both semesters. *One-half unit.* (Not given in 1940-1941.) Assistant Professor Kessler.

101a-101b. Chromatic and Modern Harmony.—Twice a week; both semesters. *One-half unit.* Assistant Professor Kessler.

105a-105b. Advanced Composition.—Twice a week; both semesters. *One unit.* Associate Professor Miles, Assistant Professor Kessler.

106a-106b. Advanced Instrumentation.—Twice a week; both semesters. *One unit.* Professor Harding, Assistant Professor Kessler.

110. Instrumental Music of the Eighteenth Century.—Once a week; two hours; first semester. *One unit.* (Not given in 1940-1941.) Associate Professor Hill.

111. The Sonata.—Once a week; two hours; second semester. *One unit.* (Not given in 1940-1941.) Associate Professor Hill.

112a-112b. Beethoven.—Once a week; two hours; both semesters. *One unit.* Associate Professor Hill.

120a-120b. Research in Special Fields.—Time to be arranged; both semesters. *One to two units.* Professors Stiven and Harding, Associate Professors Hill and Miles, Assistant Professors Kessler and Kauffman.

130. Administration and Supervision of Music Education.—Twice a week; second semester. *One unit.* Assistant Professor Kauffman.

138a-138b. Advanced Conducting and Administration.—Twice a week; both semesters. *One unit.* Professor Harding.

142a-142b. Piano Literature.—Twice a week; both semesters. *One unit.* Associate Professor Schoonmaker.

152a-152b. Vocal Literature.—Twice a week; both semesters. *One unit.* Assistant Professor Bowen.

162a-162b. String Instruments Literature.—Twice a week; both semesters. *One unit.* Assistant Professor Roosa.

182a-182b. Organ Literature.—Twice a week; both semesters. *One unit.* Associate Professor Miles.

Courses for Graduates and Advanced Undergraduates

6a-6b. Theory of Music (Free Counterpoint).—Twice a week; both semesters. Associate Professor Miles.

9-10. Analysis, Musical Form.—Twice a week; both semesters. Associate Professor Hill.

11a-11b. Composition in Smaller Forms.—Once a week; both semesters. Associate Professor Miles, Assistant Professor Kessler.

12a-12b. Composition in Larger Forms.—Twice a week; both semesters. Associate Professor Miles, Assistant Professor Kessler.

19a-20a. Double Counterpoint, Canon, and Fugue.—Three times a week; both semesters. Assistant Professor Kessler.

28a-28b. Music Dramas of Richard Wagner.—Twice a week; both semesters. Professor Stiven.

32-33. Advanced History of Music.—Twice a week; both semesters. Associate Professor Hill.

Applied Music (Junior and Senior Grade)

(Only students who can qualify to enter these courses as major students may elect them for graduate credit.)

44a-47b. Piano.—Twice a week; both semesters. Associate Professor Schoonmaker, Assistant Professors Watt, Fletcher, and Branigan.

54a-57d. Voice.—Twice a week; both semesters. Assistant Professors Hamp, Bowen, and Foote.

64a-67b. Violin.—Twice a week; both semesters. Assistant Professor Roosa.

74a-77b. Violoncello.—Twice a week; both semesters. Miss Wagar.

84a-87b. Organ.—Twice a week; both semesters. Associate Professor Miles.

PHILOSOPHY

Students beginning graduate work with philosophy as their major subject must have had a general course in the history of philosophy, a course in logic, and a general course in psychology.

Courses for Graduates

105. Seventeenth Century Continental Thought.—Twice a week; first semester. *One unit.* Associate Professor Gotshalk.
112. German Idealism (Kant).—Twice a week; second semester. *One unit.* Associate Professor Gotshalk.
114. Recent Logical Theory: Logical Syntax and Semantics.—Twice a week; second semester. *One unit.* Professor Black.
119. Seminar in Ancient Philosophy.—Twice a week; first semester. *One unit.* Professor McClure.
124. Contemporary Problems: Philosophy of A. N. Whitehead.—Twice a week; first semester. *One unit.* Professor Murphy.

Courses for Graduates and Advanced Undergraduates

3. History of Ancient and Medieval Philosophy.—Three times a week; first semester. Associate Professor Nicholson.
4. History of Modern Philosophy.—Three times a week; second semester. Associate Professor Gotshalk.
9. Philosophy of Law and of the State.—Three times a week; second semester. Dr. Negley.
10. Philosophy of Science.—Three times a week; first semester. Professor Black.
12. Philosophy of Art.—Three times a week; first semester. Associate Professor Gotshalk.
13. Ethics and Value Theory.—Three times a week; second semester. Professor Murphy.
15. Great Books in Modern Thought (Hume, Darwin, Marx, Freud).—Three times a week; first semester. Dr. Will.
16. Metaphysics.—Three times a week; second semester. Associate Professor Gotshalk.
17. Symbolic Logic.—Three times a week; first semester. Professor Black.
18. Philosophical Ideas: Rousseau to Bergson.—Three times a week; first semester. Professor Murphy.
21. Theory of Knowledge.—Three times a week; second semester. Dr. Will.
22. American Philosophy (Royce, James, Santayana, and Dewey).—Three times a week; second semester. Professor Murphy.
23. The Philosophy of Plato.—Three times a week; second semester. Associate Professor Nicholson.

PHYSICAL EDUCATION

The following courses are open to graduate students, both men and women, who wish to make physical education a minor as part of the requirements for advanced degrees in other departments. The prerequisite for admission to these courses is twenty semester hours of approved undergraduate work in physical education, but students who present evidence of satisfactory teaching experience may have this requirement reduced.

Courses for Graduates and Advanced Undergraduates

31. Problems in Physical Education.—Deals particularly with the curriculum. Once a week; first semester. *One unit.* Professor Staley.

32. Problems in School Health.—Deals particularly with health service programs. Once a week; second semester. *One unit.* Professor Stafford.

PHYSICS

A year of calculus and a year of general physics, with laboratory, are prerequisite for all major and minor graduate work in physics. In addition, graduate students whose major is physics must have had one more advanced course in either physics or mathematics and should be able to use references in German.

Courses for Graduates

109. Historical Development of Physics.—One two-hour period a week; second semester. *One unit.* (Not given in 1940-1941.)

122a-122b. Dynamics.—Three times a week; both semesters. *One unit.* Dr. Dancoff.

123. Dynamical Theory of Sound.—Three times a week; second semester. *One unit.* Dr. Bolt.

125. Hydrodynamics.—Especially modern problems in flow and turbulence. First semester. *One unit.* (Not given in 1940-1941.)

127a-127b. Relativity.—Twice a week; both semesters. *One-half unit.* (Not given in 1940-1941.) Associate Professor Mott-Smith.

128. Problems and Methods in Theoretical Physics.—First semester. *One unit.* (Not given in 1940-1941.)

129a-129b. Mechanical Vibrations.—The general theory, with applications to plates, rotating shafts, gyroscopes, structures, etc. Twice a week; both semesters. *One-half unit.* (Not given in 1940-1941.)

144a-144b. Advanced Electric and Magnetic Measurements.—Both semesters. *One unit.* (Not given in 1940-1941.) Associate Professor Williams.

146a-146b. Electrodynamics.—Three times a week; both semesters. *One unit.* Assistant Professor Serber.

160. Thermodynamics.—First semester. *One unit.* (Not given in 1940-1941.)

163. Statistical Mechanics.—Three times a week; second semester. *One unit.* (Not given in 1940-1941.) Associate Professor Mott-Smith.

170a-170b. Advanced Physical Optics.—Electromagnetic theory of light. Both semesters. *One unit.* (Not given in 1940-1941.) Associate Professor Almy.

181a. Quantum Mechanics.—Introductory course. Three times a week; second semester. *One unit.* Assistant Professor Serber.

181b. Quantum Mechanics.—Collision theory and nuclear problems. Three times a week; first semester. *One unit.* Assistant Professor Serber.

182. Conduction of Electricity Through Gases.—Three times a week; first semester. *One unit.* (Not given in 1940-1941.) Associate Professor Mott-Smith.

183a-183b. Nuclear Physics.—Three times a week; both semesters. *One unit.* Assistant Professor Goldhaber.

184. Line Spectra and Atomic Structure.—Three times a week; first semester. *One unit.* Associate Professor Almy.

185. Band Spectra and Molecular Structure.—Three times a week; second semester. *One unit.* Associate Professor Almy.

186a-186b. Advanced Quantum Mechanics.—Theory of measurements, transformation theory, quantum electrodynamics, theory of elementary particles. Three times a week; both semesters. *One unit.* (Not given in 1940-1941.) Associate Professor Bartlett.

190. Research.—Both semesters. *One to three units.* Professors in the department.

191a-191b. Modern Laboratory Practice.—Emphasis on experimental atomic physics: vacuum technique, gaseous discharges, x-rays, thermionics, photoelectricity, electron diffraction, nuclear physics, etc. Both semesters. *One unit.* Assistant Professor Haworth.

198. Seminar.—Both semesters. *One to two units.* Professors in the department.

199. Physics Colloquium.—Attendance is expected of all graduate students. Once a week; both semesters. *No credit.*

Courses for Graduates and Advanced Undergraduates

15. Elementary Electricity and Magnetism.—Recommended to students in non-technical courses. Two recitations or lectures and one three-hour laboratory exercise weekly; second semester. Associate Professor Williams.

16. Elementary Heat.—Three times a week; first semester. Associate Professor Paton.

17. Elementary Light.—Two lectures and a three-hour laboratory period weekly; first semester. Dr. Lyman.

20a-20b. Theoretical Mechanics.—Three times a week; both semesters. Dr. Manley.

23. Sound.—Three times a week; first semester. Dr. Bolt.

25. Architectural Acoustics.—Twice a week; second semester. Dr. Bolt.

30. Introduction to Theoretical Electricity.—For advanced students in physics, chemistry, mathematics, and engineering. Three times a week; first semester. Associate Professor Williams.

40a-40b. Electricity and Magnetism.—Two lectures and a three-hour laboratory period weeky; both semesters. Dr. Jordan.

44. Electric and Magnetic Measurements.—Two three-hour periods a week; both semesters. Associate Professor Williams.

46. Vacuum Tubes.—Applications to physical laboratory problems. One lecture and two three-hour laboratory periods weekly; second semester. Assistant Professor Richardson.

60. Heat.—Three times a week; second semester. Associate Professor Paton.

62. Kinetic Theory of Heat and Radiation.—Three times a week; second semester. (Not given in 1940-1941.) Dr. Manley.

71a-71b. Light.—For advanced students in physics, chemistry, mathematics or engineering. Twice a week; both semesters. Associate Professor Almy.

72a-72b. Light Laboratory.—To accompany Physics 71a-71b. Twice a week; both semesters. Associate Professor Almy.

73. Elementary Photography.—Two lectures and two three-hour laboratory periods a week; second semester. Dr. Lyman.

80. Atomic Physics.—A lecture and problem course presenting our modern knowledge of the nature and properties of atoms, ions, electrons, protons, positrons, light quanta, photoelectricity, thermoelectric emission, x-rays, radioactivity, and cosmic rays. Three times a week; first semester. Professor Kruger.

81. Radioactivity and Nuclear Physics.—Three times a week; second semester. Professor Kruger.

PHYSIOLOGY

The prerequisites for graduate work in physiology are Physiology 1, 1a, 5, 6, and 7, or equivalents.

Courses for Graduates

101. Journal Club.—Review of literature. Both semesters. *One-fourth unit.* Assistant Professor Steggerda.

102. Research.—Both semesters. *One to two units.* Associate Professor Burge, Assistant Professor Steggerda, Dr. Taylor.

103. Experimental Physiology.—Respiration, circulation, digestion, metabolism, excretion, secretion, glands of internal secretion, nervous system. Both semesters. *One-half to one unit.* Associate Professor Burge, Assistant Professor Steggerda.

Courses for Graduates and Advanced Undergraduates

6. Advanced Mammalian Physiology.—Muscle, nervous system, blood, and circulatory system. Five times a week; first semester. Assistant Professor Steggerda, Dr. Taylor.

7. Advanced Mammalian Physiology.—Respiration, digestion, excretion, and endocrine glands. Five times a week; second semester. Assistant Professor Steggerda, Dr. Taylor.

POLITICAL SCIENCE

Graduate work in political science is conducted in the following special fields: political theory; international law and relations; American and foreign governments; constitutional law, administrative law, and jurisprudence; public administration.

Candidates for advanced degrees in political science must have had at least twenty hours of undergraduate work in political science, economics, sociology, and history, not less than twelve hours of which have been in political science (which may include three hours in constitutional history). If a student making political science his major is taking both of his minors in other departments, one of them must be in history, economics, or sociology.

Several courses given in other departments are so closely related to those in political science that graduate students whose major is political science may be permitted on petition to take such courses as part of their major work. Attention is called to the bulletin on *University Training for the Public Service* and to the courses in public law in the College of Law, the courses in public finance in the College of Commerce and Business Administration, the courses in city and regional planning in the College of Fine and Applied Arts, and the courses in municipal and sanitary engineering in the College of Engineering.

Graduate students in other departments who choose political science as a minor must have had at least six hours of undergraduate work in political science and three hours in economics, sociology, or history.

Courses for Graduates

101a-101b. History of Political Theories.—Three times a week; both semesters. *One unit.* Associate Professor Wilson.

102. The Nature of the State.—Twice a week; second semester. *One unit.* (Not given in 1940-1941.)

103a-103b. Seminar in Political Science and Public Law.—Once a week; both semesters. *One-half to four units.* Members of the department.

104. Municipal Administration.—Twice a week; second semester. *One unit.* Professor Kneier.

105. Constitutional Law.—Research in selected topics. Twice a week; first semester. *One unit.* Professor Mathews.

106. International Law.—Research in selected topics. Both semesters. *One unit.* Dr. Jobst.

107. Foreign Relations of the United States.—Twice a week; second semester. *One unit.* Professor Mathews.

108. Problems of International Organization.—Special problems in the field of international organization, with particular attention to the League of Nations. First semester. *One unit.* Professor Berdahl.

112. Public Administration.—Special topics in national, state, or local administration in the United States. Twice a week; second semester. *One unit.* Professor Fairlie.

113. State Government.—Research in selected topics. First semester. *One unit.* (Not given in 1940-1941.) Professor Mathews.

114. Political Parties.—Second semester. *One unit.* Professor Berdahl.

121. Problems in British Government.—Twice a week; first semester. *One unit.* Professor Fairlie.

128. Contemporary Governmental Problems.—*One unit.* (Not given in 1940-1941.)

Courses for Graduates and Advanced Undergraduates

4. Municipal Government.—Three times a week; first semester. Professor Kneier, Dr. Snider.

5. American Constitutional System.—Three times a week; first semester. Professor Mathews.

6a. International Law.—Three times a week; first semester. Dr. Jobst.

6b. International Law.—(Continuation of 6a.) Three times a week; second semester. Dr. Jobst.

7. American Foreign Relations.—Twice a week; second semester. Professor Mathews.

8. International Organization.—Twice a week; first semester. Professor Berdahl.

9. Principles of Jurisprudence.—Three times a week; second semester. Professor Fairlie.

11. The Constitution and Industrial Legislation.—Three times a week; second semester. Assistant Professor Hagan.

12a. Public Administration.—Three times a week; first semester. Professor Fairlie.

12b. Problems in Public Administration.—Twice a week; second semester. Professor Fairlie.

13. Government and the Economic Order.—Three times a week; first semester. Assistant Professor Hagan.

14a. Political Parties: Party History and Issues.—Three times a week; second semester. Professor Berdahl.

14b. Political Parties: Organization and Methods.—Three times a week; first semester. (Not given in 1940-1941; alternates with Political Science 14a.) Professor Berdahl.

18. Legislation in the United States.—Three times a week; second semester. (Not given in 1940-1941.)

21. British Government.—Twice a week; first semester. Professor Fairlie.

22. Continental European Governments.—The constitutions and political systems of the principal countries of continental Europe. Three times a week; second semester.

28. Current Governmental Problems.—Twice a week; second semester. (Not given in 1940-1941.)

32. Principles of Political Science.—Three times a week; first semester. Associate Professor Wilson.

33. Contemporary Political Theory.—Three times a week; second semester. Associate Professor Wilson.

34. Municipal Problems.—Municipal administration in the United States and Europe. Three times a week; second semester. Professor Kneier, Dr. Snider.

38. International Relations.—Three times a week; first semester. (Not given in 1940-1941.)

PSYCHOLOGY

Graduate students who elect psychology as their major subject must have had standard courses, of university grade, both in general psychology and in the psychological laboratory. One general university course is the minimal requirement for graduate students who apply to the department for a minor subject.

Training in clinical psychology is provided by courses offered at the Institute for Juvenile Research in Chicago. The prerequisite to these courses is recommendation by the Department of Psychology and one year of graduate work with a major in psychology, or, in case of especially qualified students who have majored in psychology as undergraduates, one semester of graduate work. The minimum period of attendance at the Institute necessary for the Master of Arts degree is six months; and for the Doctor of Philosophy degree, one academic year. Recommended minors are education and sociology.

Courses for Graduates

103a-103b. Research.—Experimental investigations. Both semesters. *One-half to two units.* Professors Woodrow and Young, Associate Professor Higginson, Assistant Professors Anderson, Feder, and Pennington.

105a-105b. Seminar.—Discussion of current topics in their historical setting, with special emphasis on research problems. Both semesters. *One unit.* Professor Woodrow.

106. Neural Theory of the Psychological Functions.—Second semester. *One unit.* Assistant Professor Pennington.

108. Quantitative Methods.—The logic of research methods in psychology. Second semester. *One unit.* Professor Woodrow.

109. Problems in Motivation.—Discussion of current research and concepts within the field of motivation. Second semester. *One unit.* Professor Young.

115. Advanced Child Psychology.—Critical evaluation of research methods and findings; practice in selected techniques of child study including experimental and clinical approaches. First semester. *One unit.* Assistant Professor Anderson.

144. Theory and Practice of Student Personnel Work.—The psychological principles and techniques of student personnel work, with special reference to methods of making provision for individual differences at the college level. Supervised observation and practice in the Personnel Bureau. Second semester. *One unit.* Assistant Professor Feder.

The following courses (counted as courses in psychology when taken by candidates for advanced degrees in psychology) are offered at the Institute for Juvenile Research in Chicago by the Department of Criminology, Social Hygiene, and Medical Jurisprudence of the College of Medicine.

101. Research in Juvenile Behavior. — *One to three units.* Professor Schroeder.

102. Advanced Work in Juvenile Behavior.—*One to three units.* Professor Schroeder.

103. Special Abilities and Disabilities.—*One or two units.* Associate Professor Brown.

104. Psychological Tests.—*One or two units.* Associate Professor Brown.

105. Psychology of Behavior Problems.—*One or two units.* Associate Professor Brown.

Courses for Graduates and Advanced Undergraduates

5. Comparative Psychology.—A systematic survey of animal behavior with particular reference to the behavior of the vertebrates. Laboratory and discussion. Three times a week; first semester. Dr. McAllister.

8. Feeling and Emotion.—Facts, problems, and methods of affective psychology with special reference to recent physiological studies. Two times a week; first semester. Professor Young.

11. Learning and Comprehension. — Processes and functions in acquiring knowledge and skill. Twice a week; first semester. Dr. Carlson.

16. Genetic Psychology.—Psychological development of the individual with special reference to childhood. Twice a week; second semester. Assistant Professor Anderson.

17. History of Psychology.—Twice a week; first semester. (Not given in 1940-1941.) Professor Young.

18. Perception.—Perceptual experience; recent revisions of perceptual theory including the doctrine of the *Gestalt.* Lectures and discussions. Twice a week; second semester. Dr. Carlson.

20. Systematic Psychology.—A critical study of contemporary systems: behaviorism, *Gestalt psychologie,* structural, functional and dynamic psychology. For seniors and graduates. Twice a week; second semester. Professor Woodrow.

23. Abnormal Psychology. — Analytical consideration of types of behavior deviating from the normal. Three times a week; both semesters. Assistant Professor Pennington, Dr. McQuitty.

26. Psychology of Thinking.—A consideration of facts and theories based on experimental studies. Three times a week; second semester. Dr. McAllister.

34. Individual Differences.—A study of the variation in the mental characteristics of individuals and of groups. Three times a week; first semester. Professor Woodrow.

43. Student Personnel Work.—The application of psychological principles and techniques in fitting education processes to the needs, interests, and abilities of the individual college student. Three times a week; first semester. Assistant Professor Feder.

SOCIAL ADMINISTRATION

Students who have the degree of Bachelor of Social Administration, or its equivalent, may qualify for the degree of Master of Social Administration by

completing a minimum of eight units work selected from the following courses. A limited number of other courses approved by the Social Administration Committee may be elected as substitutes for courses listed. A total of 960 clock hours of approved field work, of which 480 hours may have been earned in securing the bachelor's degree, is required.

Courses for Graduates

106. Urban Communities and Urbanization.—Same as Sociology 106. Twice a week; second semester. *One unit.* Assistant Professor Tylor.

107. Rural Communities.—Same as Sociology 107. Twice a week; second semester. *One unit.* (Not given in 1940-1941.) Assistant Professor Tylor.

108. Research in Social Effects of Poverty, Their Prevention and Treatment.—Same as Sociology 108. Twice a week; first semester. *One unit.* Associate Professor Timmons.

109. Criminology.—Same as Sociology 109. Twice a week; second semester. *One unit.* Professor Taft.

112. Public Welfare Administration.—Same as Political Science 112. Twice a week; second semester. *One unit.* Professor Fairlie.

124. Advanced Penology.—Same as Sociology 124. Twice a week; first semester. *One unit.* Professor Taft.

150. Seminar and Research.—The field, type, and amount of work are to be adjusted to the needs of the student. Both semesters. *One-half to two units.* Members of the staff.

154a-154b. Advanced Social Field Work.—Both semesters. *One-half unit each semester.* Associate Professor Klein.

155. Advanced Social Case Work.—First semester. *One-half unit.* Associate Professor Klein.

158. Theory of Social Work.—Twice a week; second semester. *One unit.* Associate Professor Timmons.

SOCIAL SCIENCES

Through the Division of the Social Sciences (including economics, geography, history, philosophy, political science, psychology, and sociology), a special program leading to the degree of Master of Arts in the Social Sciences is available to meet the needs of students who wish to study in several related fields within the Social Sciences rather than to specialize in one department, and the needs of those who contemplate teaching the Social Sciences. To qualify for this program a student, in addition to meeting the general requirements of the Graduate School, must have had twenty hours of undergraduate credit in the Social Sciences, and preparation in the particular departments within the division in which he elects to work substantially equivalent to the minor requirements of those departments. Work must be done in at least three departments within the division, or in two departments and in education. If work in education is elected, it may not exceed two units. No thesis is required but, in order to qualify for the degree, a student must pass a comprehensive examination.

SOCIOLOGY

Graduate students electing sociology as their major must have had at least eight hours of undergraduate work in sociology and fifteen hours in one or

more of the following subjects: philosophy, history, psychology, genetics, economics, and political science. Sociology 17 is required of all graduate majors in this department. Those who select sociology as a minor must have had at least six hours of undergraduate work in sociology.

Courses for Graduates

100. General Sociology.—Twice a week; first semester. *One unit.* Professor Hiller.
101. Sociological Theory and Method.—Twice a week; second semester. *One unit.* Professor Znaniecki.
102. Recent Developments in Sociology.—Twice a week; second semester. *One unit.* Associate Professor Albig.
106. Urban Communities and Urbanization.—Twice a week; second semester. *One unit.* Assistant Professor Tylor.
107. Rural Communities.—Twice a week; second semester. *One unit.* (Not given in 1940-1941.) Assistant Professor Tylor.
108. Research in Social Effects of Poverty, Their Prevention and Treatment.—Twice a week; first semester. *One unit.* Associate Professor Timmons.
109. Criminology.—Twice a week; second semester. *One unit.* Professor Taft.
110. Population Problems.—Twice a week; second semester. *One unit.*
112. Theory of Social Groups.—Twice a week; first semester. *One unit.* Professor Znaniecki.
121. Folk Sociology.—Twice a week; second semester. *One unit.* (Not given in 1940-1941.)
122. Regional Problems and Planning.—Twice a week; second semester. *One unit.* (Not given in 1940-1941.)
124. Advanced Penology.—Twice a week; first semester. *One unit.* Professor Taft.
128. Fusion of Culture Resulting from Immigration.—Twice a week; second semester. *One unit.* (Not given in 1940-1941.) Professor Hiller.
129. Modern Human Migrations.—Twice a week; first semester. *One unit.* (Not given in 1940-1941.) Professor Taft.
150. Seminar and Research.—The field, type, and amount of work are to be adjusted to the needs of the student in the respective graduate years. Both semesters. *One-half to three units.* Members of the department.

Courses for Graduates and Advanced Undergraduates

3. Social Evolution.—Three times a week; both semesters. Mr. Ahrens.
5. The Family.—Three times a week; both semesters. Associate Professor Timmons.
6. Sociology of the City.—Three times a week; second semester. Assistant Professor Tylor.
7. Rural Sociology.—Three times a week; second semester. Associate Professor Lindstrom.
8. Charities.—Three times a week; first semester. Associate Professor Timmons.
9. Criminology.—Three times a week; both semesters. Professor Taft.
10. Population Problems and Human Ecology.—Three times a week; second semester.
11. Sociology of the Region.—Three times a week; second semester. Assistant Professor Tylor.
14. Public Opinion.—Three times a week; both semesters. Associate Professor Albig.
17. Methods of Sociological Research.—Three times a week; first semester. Professor Hiller.
18. Recent Developments in Public Welfare Administration.—Three times a week; second semester. Associate Professor Klein.

20. Social Progress and Social Values.—Three times a week; first semester.
24. Penology.—Three times a week; second semester. Professor Taft.
25. Prevention and Treatment of Juvenile Delinquency.—Three times a week; first semester. Professor Taft.
27. Community Welfare Organization.—Three times a week; second semester. Associate Professor Klein.
28. Immigration and Assimilation.—Three times a week; second semester. Professor Hiller.
30. Races of Mankind.—Three times a week; first semester. (Not given in 1940-1941.)
40. Ethnology of the American Indians.—Three times a week; first semester. (Not given in 1940-1941.)
42. Primitive Societies.—Three times a week; first semester. Associate Professor Albig.
44. The Negro.—Three times a week; second semester. (Not given in 1940-1941.)
45. Prehistoric Archeology.—Three times a week; first semester. (Not given in 1940-1941.)
60. European Sociological Thought.—Three times a week; both semesters. Professor Znaniecki.
61. Social Classes.—Three times a week; second semester.
70. Social Relations.—Three times a week; second semester. Professor Znaniecki.
72. Social Roles.—Three times a week; first semester. Professor Znaniecki.

SPANISH AND ITALIAN

SPANISH

Students beginning graduate work for an advanced degree in Spanish must have had at least three years of college work in Spanish, including one advanced literary course. Students who have a knowledge of Latin and of French or Italian, together with a reading knowledge of German, will find their work for an advanced degree greatly facilitated.

Courses for Graduates

130a-130b. Spanish Literature in the Sixteenth Century.—Twice a week; both semesters. *One unit.* Professor Van Horne.
131a-131b. Spanish Literature in the Seventeenth Century.—Twice a week; both semesters. *One unit.* (Not given in 1940-1941.) Associate Professor Hamilton.
134a-134b. Spanish Literature in the Eighteenth Century.—Twice a week; both semesters. *One unit.* (Not given in 1940-1941.) Associate Professor Hamilton.
135a-135b. La Novela Española Moderna.—Twice a week; both semesters. *One unit.* Associate Professor Hamilton.
138a-138b. Spanish-American Literature.—Twice a week; both semesters. *One unit.* (Not given in 1940-1941.) Professor Van Horne.
139a-139b. Spanish Literature in the Middle Ages.—Twice a week; both semesters. *One unit.* (Not given in 1940-1941,) Associate Professor Hamilton.
185a-185b. Old Spanish Readings.—Twice a week; both semesters. *One unit.* Associate Professor Hamilton.
195a-195b. Seminar.—Research work in special topics. Both semesters. *One to two units.* Professor Van Horne, Associate Professor Hamilton.

Courses for Graduates and Advanced Undergraduates

10a-10b. Survey of Spanish Literature—Three times a week; both semesters. Associate Professor Hamilton.

11a-11b. Cervantes: Don Quixote.—Twice a week; both semesters. Dr. Elsdon.

17a-17b. Modern Spanish Drama.—Twice a week; both semesters. Associate Professor Hamilton.

ITALIAN

Students beginning graduate work for an advanced degree in Italian must have had at least three years of college work in Italian, including one advanced literary course. Students who have a knowledge of Latin and of French or Spanish, together with a reading knowledge of German, will find their work for an advanced degree greatly facilitated.

Courses for Graduates

140a-140b. Italian Literature in the Middle Ages. Petrarch, Boccaccio.—Twice a week; both semesters. *One unit.* Professor Van Horne.

143a-143b. Italian Literature in the Renaissance.—Twice a week; both semesters. *One unit.* (Not given in 1940-1941.) Professor Van Horne.

146a-146b. Modern Italian Literature.—Twice a week; both semesters. *One unit.* (Not given in 1940-1941.) Professor Van Horne.

195a-195b. Seminar.—Research work in special topics. Both semesters. *One to two units.* Professor Van Horne, Associate Professor Hamilton.

Courses for Graduates and Advanced Undergraduates

3a-3b. Dante: The Divine Comedy.—Twice a week; both semesters. Miss Pietrangeli.

THEORETICAL AND APPLIED MECHANICS

Graduate students electing theoretical and applied mechanics as their major must have had the equivalent of the undergraduate courses required for a bachelor's degree in general engineering. The courses open to seniors may be taken for minor credit by graduate students whose major is in other departments.

Courses for Graduates

101. Development of Basic Ideas in Mechanics.—Twice a week; both semesters. *One unit.* Professor Moore.

103. Fluid Mechanics.—Twice a week; both semesters. *One unit.* Assistant Professor Kittredge.

107. Laboratory Investigations in Strength of Materials.—Twice a week; both semesters. *One-half to two units.* Professor Moore, Assistant Professor Dolan.

108. Laboratory Investigations in Hydraulics.—Twice a week; both semesters. *One-half to two units.* Assistant Professors Kittredge and Lansford.

109. Laboratory Investigations in Plain and Reinforced Concrete.—Twice a week; both semesters. *One to two units.* Professor Richart.

110. Analytical Study of Experimental Work on Reinforced Concrete.—Beams, frames, and footings. Twice a week; first semester. *One unit.* Professor Richart.

111. Analytical Study of Experimental Work on Reinforced Concrete.—Columns and slabs. Twice a week; second semester. *One unit.* Professor Richart.

112. Structural Mechanics.—Three times a week; first semester. *One unit.* Assistant Professor Schwalbe.

113. Selected Topics in Structural Mechanics.—Twice a week; second semester. *One-half unit.* Assistant Professor Schwalbe.

114. Theory of Elasticity with Applications to Engineering Problems.—Three times a week; first semester. *One unit.* Assistant Professor Newmark.

115. Theory of Elasticity with Applications to Engineering Problems.—Continuation of 114. Twice a week; second semester. *One unit.* Assistant Professor Newmark.

116. Resistance of Materials.—Three times a week; first semester. *One-half to one unit.* Professor Seely.

117. Properties of Engineering Materials.—Three times a week; second semester. *One-half to one unit.* Professor Seely.

198. Thesis.—Both semesters. *One to two units.* Members of the department.

Courses for Graduates and Advanced Undergraduates

41. Advanced Mechanics of Materials.—Three times a week; first semester. Professor Seely, Mr. Smith.

42. Engineering Materials.—Three times a week; second semester. Professor Seely, Assistant Professor Collins.

43. Fluid Mechanics and Advanced Hydraulics Laboratory.—Twice a week; both semesters. Assistant Professor Lansford.

44. Advanced Laboratory Work in Testing Materials.—Twice a week; both semesters. Professor Putnam.

47. Engineering Analysis.—Three times a week; first semester. Assistant Professor Jensen.

48. Engineering Analysis.—Continuation of 47. Three times a week; second semester. Assistant Professor Jensen.

49. Advanced Dynamics and Vibrations.—Three times a week; first semester. Assistant Professor Dolan.

50. Advanced Dynamics and Vibrations.—Continuation of 49. Three times a week; second semester. Assistant Professor Dolan.

ZOOLOGY

Graduate students who choose zoology as a major must have had at least two years of undergraduate work in zoology, except that under special circumstances advanced courses in closely allied subjects may be accepted in place of the fourth semester of zoology. Graduate students in other departments who choose zoology as a minor must have had at least one year of undergraduate work in zoology or ten hours of any laboratory science.

A reading knowledge of German and French is indispensable for graduate study in zoology, and familiarity with Latin and Greek is of great advantage.

Graduate students whose major is zoology are strongly advised to study at least one summer at a marine biological station. Every candidate for the Doctor of Philosophy degree in zoology is required to furnish evidence of

having completed satisfactorily at least six weeks of work at an approved station.

Although no special degree in wildlife management is offered, students may prepare themselves for that type of work by selecting courses from the following list: Zoology 11, 17, 18, 19, 26, 31, 109, 110, 111, and research courses. Such students should choose their minors from botany, physiology, entomology, and bacteriology.

Courses for Graduates

102. Classification, Phylogeny, and Evolution of Vertebrates.—Twice a week; second semester. *One unit.* Professor Adams.

103. Cytology.—Twice a week; first semester. *One unit.* Associate Professor Adamstone.

106. Advanced Vertebrate Embryology.—Twice a week; first semester. *One unit.* Professor Shumway.

107. Experimental Vertebrate Embryology.—Twice a week; second semester. *One unit.* Professor Shumway.

109. Physiological Ecology.—Twice a week; second semester. *One-half to one unit.* (Given in 1940-1941 and in alternate years.) Professor Shelford, Assistant Professor Kendeigh.

110. Climatic Ecology.—Twice a week; second semester. *One-half to one unit.* (Given in alternate years; not given in 1940-1941.) Professor Shelford.

111. Advanced Field Ecology.—Once a week; both semesters. *One-fourth to one unit.* Professor Shelford.

115. Advanced Genetics.—Twice a week; first semester. *One unit.* Assistant Professor Luce.

117. Invertebrate Taxonomy.—Twice a week; second semester. *One-half to one unit.* Professor Van Cleave.

118. Advanced Protozoology.—Twice a week; second semester. *One unit.* Associate Professor Kudo.

120. Individual Research.—Both semesters. *One to two units.* Work may be taken in the following fields:
Invertebrate Zoology and Parasitology.—Professor Van Cleave, Assistant Professor Thomas, Dr. Ingle.
Vertebrate Zoology.—Professor Adams, Assistant Professor Hall.
Vertebrate Embryology.—Professor Shumway.
Genetics and Regeneration.—Assistant Professor Luce.
Animal Ecology and Wildlife Management.—Professor Shelford, Assistant Professor Kendeigh.
Histology and Cytology.—Associate Professor Adamstone.
Protozoology.—Associate Professor Kudo.
Physiological Zoology.—Assistant Professor Prosser.

131. Helminthology.—Twice a week; second semester. *One-half to one unit.* Professor Van Cleave, Assistant Professor Thomas.

Courses for Graduates and Advanced Undergraduates

3. Vertebrate Embryology.—Five times a week; both semesters. Professor Shumway, Associate Professor Adamstone.

6. Vertebrate Histology.—Twice a week; second semester. Associate Professor Adamstone.

11. Animal Ecology and Geography.—Three or four times a week; first semester. Professor Shelford.

17. Field Zoology.—Two or three times a week; first semester. Professor Van Cleave, Dr. Ingle.

18. Protozoology.—Three times a week; first semester. Associate Professor Kudo.

19. Wildlife Management.—Twice a week; first semester. Assistant Professor Kendeigh, Professor Shelford.

20a-20b. Seminar.—Graduate students are expected to attend all general seminars and one special seminar weekly.

General Seminar.—Once a month; both semesters. Professor McClung.

Special Seminars.—Once a week; both semesters. Members of the department.

Animal Ecology.—Ecology and ornithology.

Genetics.—(Interdepartmental.)

Experimental Biology.—(Interdepartmental.)

Invertebrate.—Invertebrate zoology, parasitology, and protozoology.

Vertebrate.—Vertebrate zoology, embryology, histology, and cytology.

21a-21b. Individual Topics.—Each student who desires topic work must receive permission both from the instructor under whom he is to work and from the head of the department. Arrange; both semesters. Members of the department.

22. Advanced Vertebrate Zoology.—Two to four times a week; first semester. Assistant Professor Hall.

23. Advanced Vertebrate Anatomy.—Two to four times a week; second semester. (Not given in 1940-1941.)

25a. Genetics.—Lecture. Three times a week; second semester. Assistant Professor Luce.

25b. Genetics.—Laboratory. Twice a week; second semester. Assistant Professor Luce.

26. Advanced Ornithology.—Twice a week; second semester. Assistant Professor Kendeigh.

31. Helminthology.—Three times a week; first semester. Assistant Professor Thomas.

41. Physiological Zoology.—Three times a week; first semester. Assistant Professor Prosser.

42. Cellular Physiology.—Three times a week; second semester. Assistant Professor Prosser.

51. Essentials of Zoology.—Three times a week; first semester. Assistant Professor Thomas.

52. Essentials of Zoology.—Three times a week; second semester. Assistant Professor Thomas.

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